JULY 1937

WIRE AND WIRE PRODUCTS

IT'S MIGHTY HARD TO BEAT TODAY'S GAME WITH YESTERDAY'S EQUIPMENT

Mechanical standards progressed further and faster in the past half-dozen years, than in any other similar period in our industrial history. Necessity did it; equipment had to improve to meet the pace.

And what is the pace? It's the variety and quality of product, the attractiveness of price and delivery, with which the most progressive manufacturer in a given field enters the market. ● If, here or there in the mill, you feel that your equipment hinders you, why not call a Vaughn Engineer into consultation?

THE VAUGHN MACHINERY COMPANY
Cuyahoga Falls, Ohio

VAUGHN WIRE DRAWING MACHINERY

COMPLETE WIRE DRAWING EQUIPMENT . . . CONTINUOUS OR SINGLE HOLE . . . FOR THE LARGEST BARS . . . FOR THE SMALLEST WIRE . . . FERROUS, NON-FERROUS MATERIALS OR THEIR ALLOYS

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

The experience of a thousand products applied to your job

Youngstown wire engineers spend much of their time in the plants of their customers. Constantly working with the daily production problems of wire users, their experience in cold heading developments has given them a vast fund of operating knowledge, all of which is ready to be applied in your shop, for your profit.

Exceptional problems in wire forming are taken to a round table discussion in Youngstown, where metallurgists, mechanical engineers, operating men and plant superintendents—*all on your staff, all working for you*—go to work to solve your worry, help cut your cost. Use this Youngstown service *now,* and you will cut rejects to a minimum, increase production, and improve your all-important net profit.

THE YOUNGSTOWN SHEET AND TUBE COMPANY

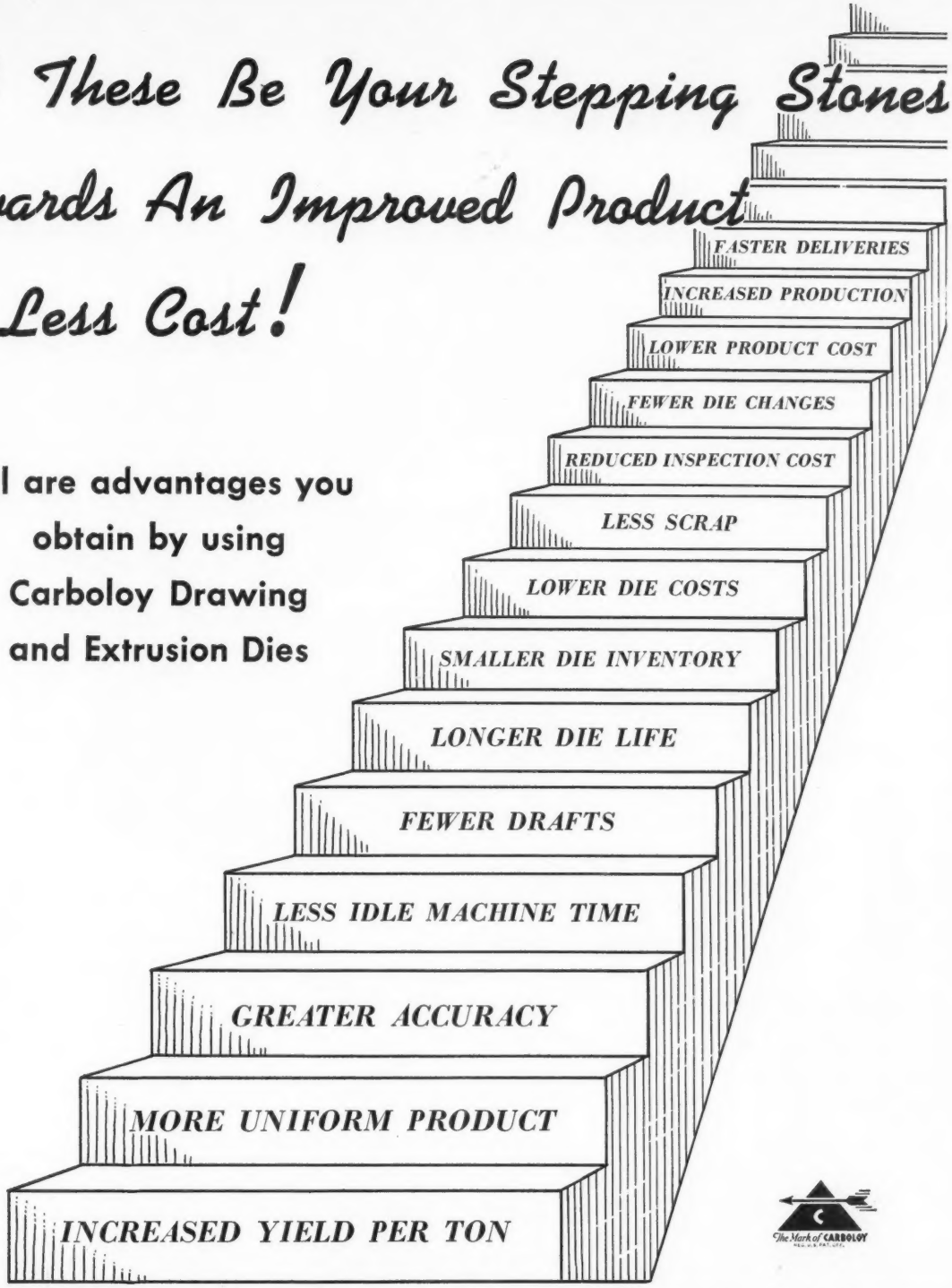
Manufacturers of Carbon and Alloy Steels • **GENERAL OFFICES** • **YOUNGSTOWN, OHIO**

Wire • Pipe and Tubular Products • Sheets • Plates • Conduit • Tin Plate • Bars • Rods • Nails • Unions • Tie Plates and Spikes 12-1

YOUNGSTOWN

Let These Be Your Stepping Stones Towards An Improved Product At Less Cost!

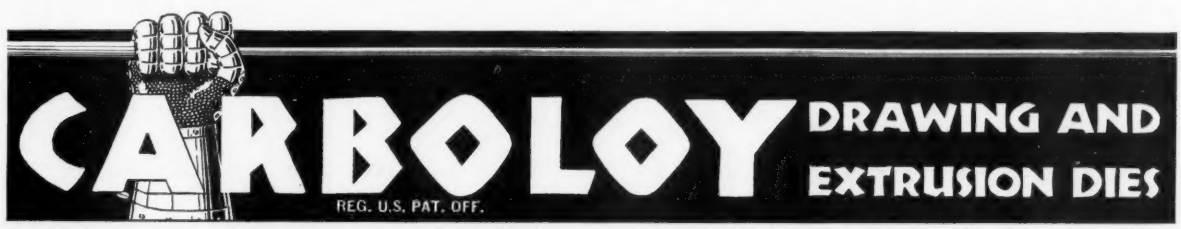
All are advantages you obtain by using Carboloy Drawing and Extrusion Dies



The Mark of CARBOLOY

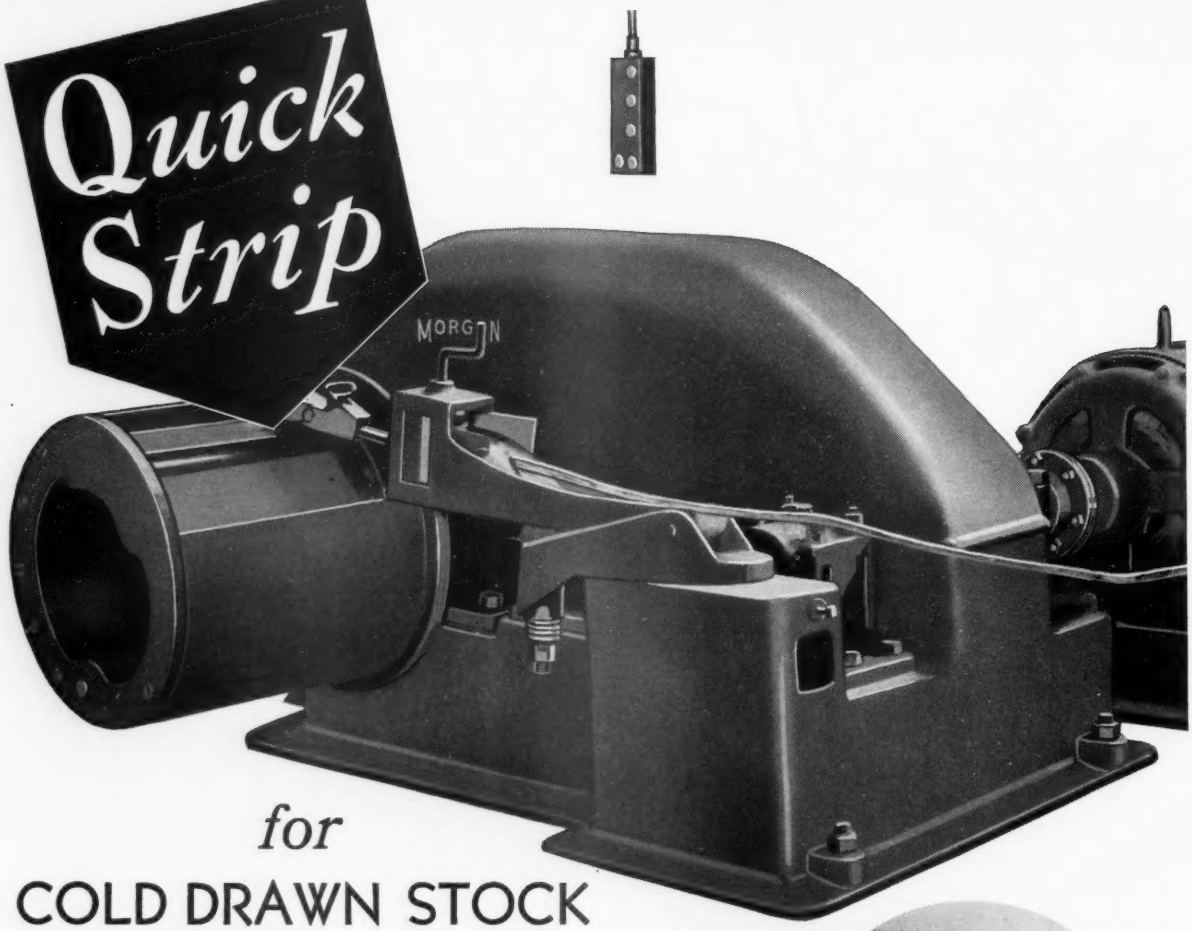
CARBOLOY COMPANY, INC. DETROIT, CHICAGO, CLEVELAND, NEWARK, PHILADELPHIA, PITTSBURGH

Authorized Distributors: Hartley Wire Die Co., Waterbury, Conn. Canadian General Electric Co., Ltd., Toronto, Ont.



WIRE & WIRE PRODUCTS, Vol 12, No. 7, July, 1937. Executive office, 17 East 42nd St., New York, N. Y. Published by the Quinn-Brown Publishing Corp., Richard E. Brown, President; R. S. Spengel, Secretary and Treasurer. Publication office, 13 West Church Street, Washington, N. J. Subscription price: U. S., $5.00; Canada, $5.00 per year, 50 cents per copy; Foreign, $7.50 per year. Entered as second class mail at the Post Office, Washington, N. J., under Act of March, 1879.

Quick Strip

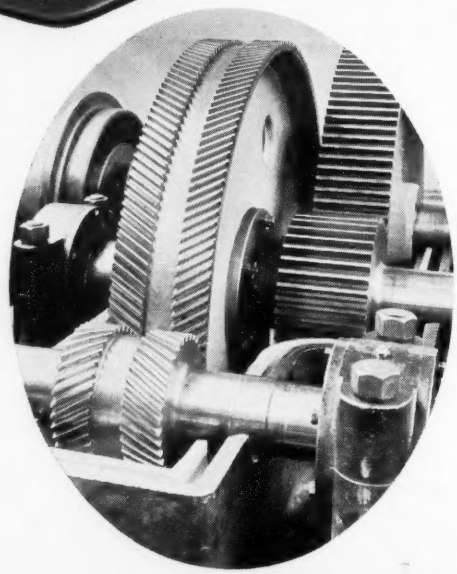


for

COLD DRAWN STOCK *up to* ONE INCH

This Morgan Horizontal Bull Block, Type 105, handles cold drawn round stock one inch or less in diameter and equivalent sections in other shapes. It is highly efficient on large-size work, the outstanding feature being the speed with which a finished bundle can be stripped from the horizontal block.

This machine is smooth, quiet and dependable in operation. The high carbon steel gears with cut teeth run in a bath of oil. In the high speed reduction, herringbone gears are used. Shaft bearings are of the roller type throughout. The block may be 24" to 36" diameter as required. Adjustable speed d. c. motor or constant speed a. c. motor is available. The space required for machine and motor is about 8 feet by 13 feet.



MORGAN *Horizontal Bull Block*

W-17

MORGAN CONSTRUCTION COMPANY WORCESTER, MASSACHUSETTS, U. S. A.

Pittsburgh FLAT WIRE

.. IN CARBON OR STAINLESS STEEL

Cold rolled Pittsburgh Flat Wire comes to your plant true to your dimension and to your specifications, ready for any of the hundreds of uses to which it may be put. It is available in either carbon or stainless steel and in almost any desired analysis. Backed by more than 40 years wire making experience, Pittsburgh Flat Wire is produced by modern equipment under an exacting system of supervision and inspection that assures uniform workability and smooth fabricating operations. Our engineering staff is always ready to assist in fitting Pittsburgh Wire products to your needs or to help you meet any unusual wire fabricating problems. For further information on Pittsburgh Flat Wire write Pittsburgh Steel Company, 1690 Grant Building, Pittsburgh, Pa. • New York, Cleveland, Detroit, Chicago, Philadelphia, Charlotte, Memphis, Tulsa, Houston, Los Angeles.

Pittsburgh Wires

FOR EVERY PURPOSE

Spring Wire • Chain Wire • Box Binding Wire • Lavite Annealed Wire • Core Wire
Cold Heading Wire • Bail Wire • Spoke Wire • Bolt Wire • Rivet Wire • Nail Wire
Welding Wire • Chaplet Wire • Cap Screw Wire • Crimping Wire • Stapling Wire
Link Wire • Tack Wire • Spark Plug Wire

"HUDCO" PRODUCTS...
Specially Processed Copper Wire...

▲▲▲ Electrolytic and Oxygen Free ▲▲▲

WIRE---

ESPECIALLY MADE FOR METALLIZING

Pure Lead
Lead Alloy
Pure Zinc
Zinc Alloy
Copper
Tin
High Brass
Low Brass
Solder Wire
Cadmium
Nickel Silver (10%, 18%, 30%)
Aluminum
Monel Metal
Phosphor Bronze
Pure Nickel
Commercial Bronze

"HUDCO" High Conductivity Electric Wire

✦ ✦ ✦

BRUSH WIRES, CRIMP and STRAIGHT

Brass, Steel, Nickel Silver, Copper and Phosphor Bronze

✦ ✦ ✦

TINSEL LAHNS

Silver Plated Copper, False Gold and Copper

✦ ✦ ✦

METALLIC FIBRE FOR PACKING PURPOSES

Copper, Bronze, Zinc, Lead and Aluminum

FINE BARE WIRES

High Brass
Low Brass
Zinc 99.99+ and High Tensile Zinc
Commercial Bronze
Phosphor Bronze
Pure Tin
Lead
Antimonial Lead
Cadmium
Nickel Silver, 10%, 18% and 30%
Silver Plated Copper
False Gold and Special Brass and Bronze Alloys to Specification

▲▲▲

Winco PRODUCTS **Leakproof Enameled Wire**

and enameled wires in all Standard and Special Covering ▲▲▲
Made to meet the most exacting requirements ▲▲▲
THE WINSTED DIVISION OF HUDSON WIRE COMPANY, WINSTED, CONN.

We can serve you quickly and economically.
Send in your specifications for a quotation.

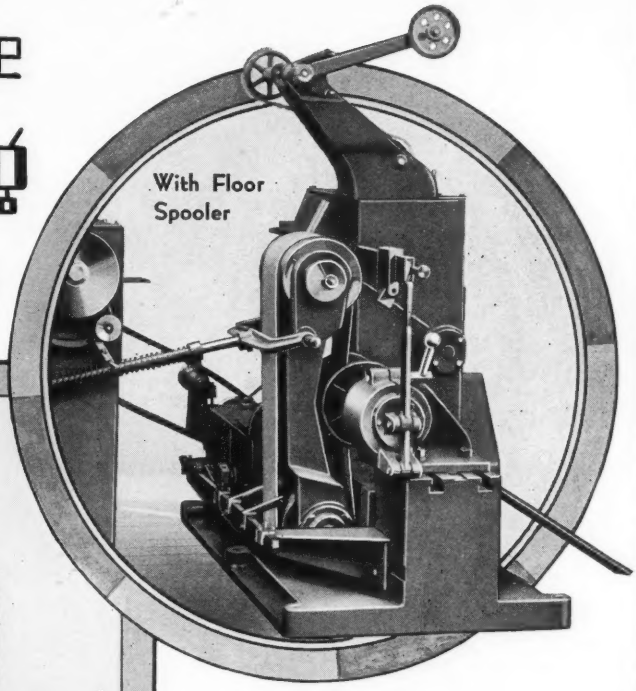
HUDSON WIRE COMPANY

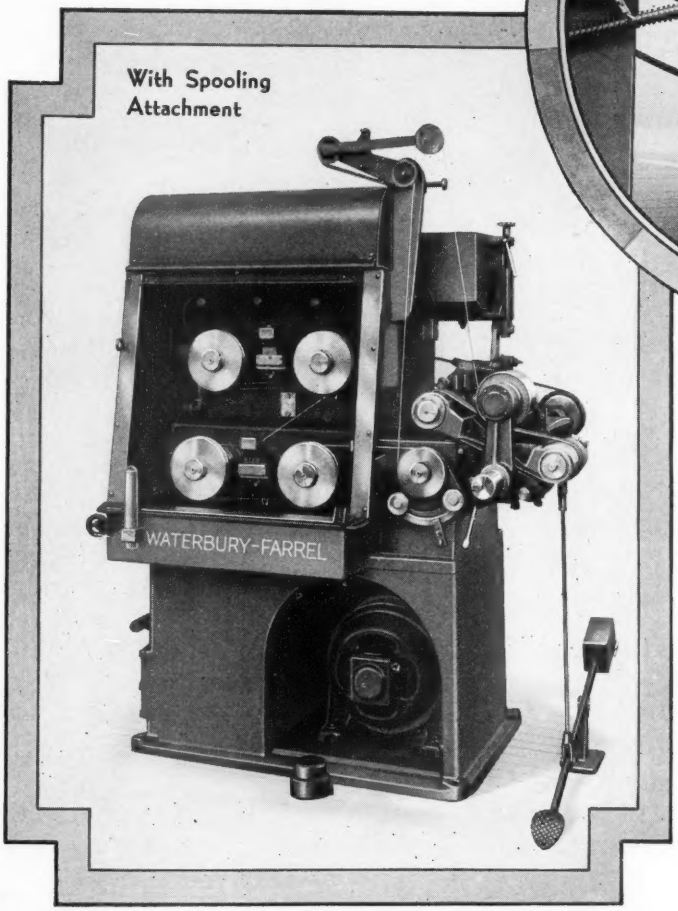
Ossining, N. Y.

Estab. 1902 — Successors ROYLE & AKIN — Estab. 1902

Waterbury-Farrel

Upright Cone Wire Drawing Machines . . .





HIGH SPEED

These high speed machines are built in four standard sizes and are intended primarily for copper wire. We illustrate the drum type construction with spooler.

Similar machines with adjustable block and reversing mechanism are available. These have been designed especially for brass and other non-ferrous alloys.

For futher particulars consult our Engineering Department.

The Waterbury Farrel Foundry and Machine Co.

HOME OFFICE AND WORKS: Bank and Meadow Sts., Waterbury, Connecticut

CLEVELAND CHICAGO NEWARK, N. J.

No. 1

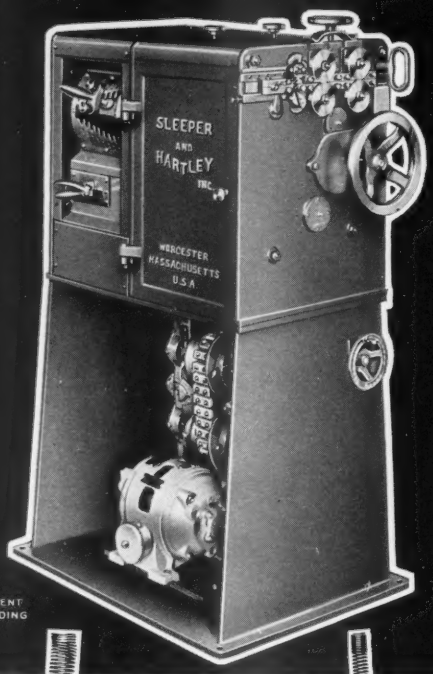
UNIVERSAL

SPRING COILER

Series 610

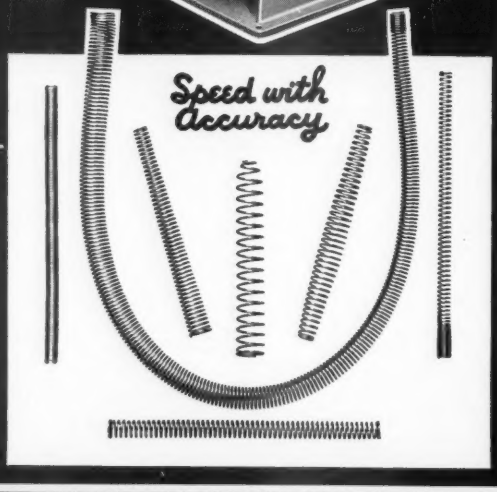
Selective Type

Over 70 different types of special machines suited to a variety of wire coiling problems.



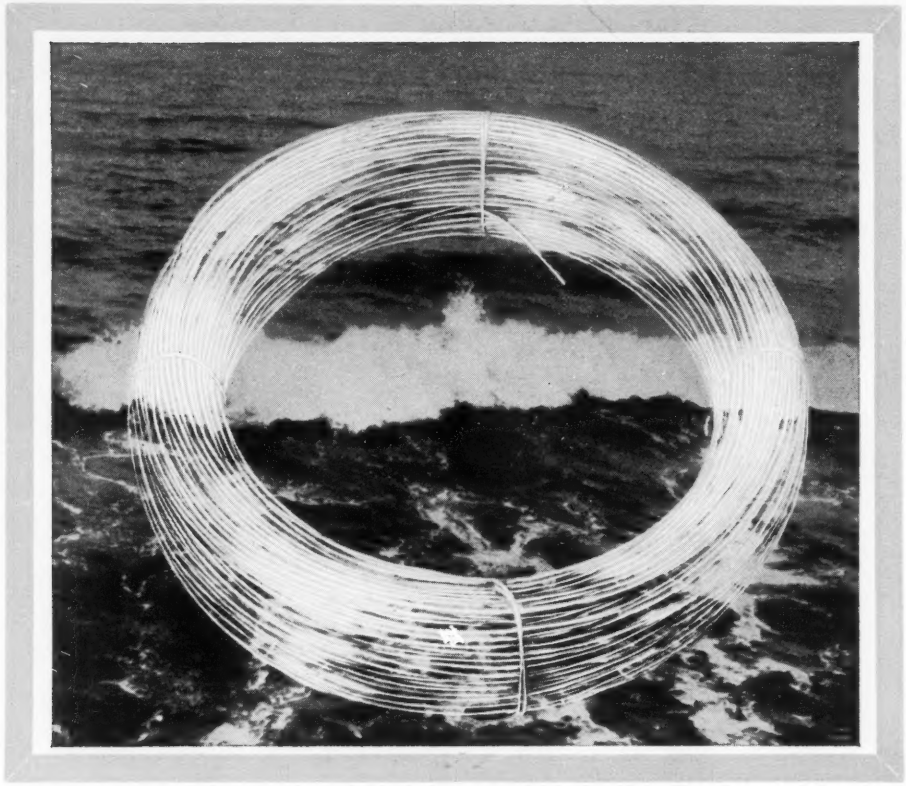
PATENT PENDING

Wire Armoring, Casing Coiling Machines—Single Hole and Continuous Wire Drawing Machines.



SLEEPER & HARTLEY, Incorporated

Worcester, Massachusetts, U. S. A.



The High Cost of "Corrosion Failure"!

A PRODUCT may seem to be correctly designed and yet fail in service because some small moving part corrodes and **doesn't** move! This is especially possible where the part functions intermittently and has no opportunity to "scour" itself. Sometimes corrosion failure may not be serious, but usually its repercussions are long, loud and expensive!

For springs, wheels, pinions, etc., that must not "freeze" in service when exposed to fresh and salt water dampness and other corroding influences, use Seymour Phosphor Bronze. This is an alloy of copper and tin, deoxidized by the addition of phosphorus to the melt. It is highly resistant to practically all corroding conditions, and, in addition, has extreme toughness and lasting resiliency. Available in sheet, wire and rod.

Glad to send test samples and a copy of the Seymour Phosphor Bronze Manual without cost or obligation.

SEYMOUR

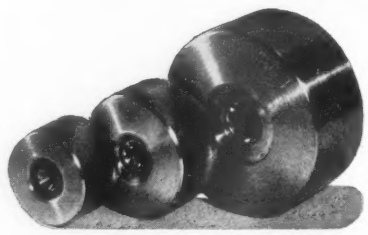
PHOSPHOR BRONZE

THE SEYMOUR MANUFACTURING COMPANY,
62 FRANKLIN ST., SEYMOUR, CONN.

Specialists in Phosphor Bronze and Nickel Silver

DIAMOND DIES CARBIDE DIES
UNWIC
UNWIDIE

"Not a better die
but the best"



UNWIDIES

Every Unwidie is forged in a patented casing and the entire assembly heat treated. This casing holds the nib uniformly on sides, back and front. The nib can not work loose. This method is more expensive, but the low breakage of Unwidies proves the economy of this exclusive feature.

UNION WIRE DIE CORPORATION

MAIN PLANT AND OFFICES — Stamford, Connecticut

BRANCHES:

Pittsburgh Chicago Cleveland Trenton Worcester New York
Hamilton, Ont., Canada Montrouge, France Paris, France

WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip Wire Products and Insulated Wire and Cable

DRAWING—ROLLING—EXTRUDING—FORMING—FABRICATING

Vol. 12 JULY, 1937 No. 7

Designated as

Official Publication By The Wire Association

Contents

The Metallurgy of Steel Wire ..... By B. L. McCarthy 343

A paper given before the Pittsburgh Meeting of the Wire Association on May 21, 1937, presenting a general summary of the role the metallurgist plays in the production of steel wire.

Wire Association Holds Pittsburgh Regional Meeting 348

Flash Baking of Wire and Rods 350

A Milestone in Metallurgical Progress (A Story of Sintered Carbide) 352

Cold Heading Problems ..... By C. L. Harvey 359

A discussion of wire suitable for cold heading and mutual problems of wire producer and the manufacturer of cold headed wire products. A paper presented before the Pittsburgh Regional Meeting of the Wire Association, May 21, 1937.

New Type of Spring Coilers 362

Charged Agricultural Fences ..... By J. Delmonte 364

Exports and Imports of Wire 365

A Review of Recent Wire Patents 368

'Round the World With the Wire Industry 371

Outstanding Personalities of the Wire Industry 374

Wire Association New Members 379

Index to Advertisers 386

Buyers' Guide 387-388

—ASSOCIATE EDITORS—

Kenneth B. Lewis, Consulting Wire Mill Engineer
W. H. Spowers, Jr., Consultant on Galvanizing
J. W. Rockefeller, Jr., Consulting Engineer for Springs and Wire Products
Lancaster, Allwine & Rommel, Consultants on Patent Information
European Correspondent
Paul Fidrmuc

R. E. Brown, Business Manager

Executive and Editorial Offices:
17 E. 42nd St., New York City. Telephone: Murray Hill 2-4188

Publication Office: Washington, N. J.

Annual Subscription, U. S. $5.00, Canada $5.00

50 Cents a Copy Issued Monthly Foreign, $7.50

Copyright 1937, Quinn-Brown Publishing Corp. WIRE AND WIRE PRODUCTS is fully protected by copyright and nothing that appears in it may be reprinted wholly or in part without permission.

VASCOLOY-RAMET · DIES AND MANDRELS

For Better Dies For Every Job

Say VASCOLOY ▲RAMET

The Tantalum Carbide Die Material • • •

Harder than the hardest of steels, immune to the action of most industrial acids, Vascoloy-Ramet is daily winning a wider acceptance throughout the wire world.

There is a Vascoloy-Ramet Die for every job, and especially for yours.

VANADIUM ALLOYS STEEL COMPANY
Vascoloy-Ramet Division
North Chicago, Illinois

District Sales Offices:

Pittsburgh.....Pa.
New York.....N. Y.
Springfield.....Mass.
Providence.....R. I.
Philadelphia.....Pa.
Cleveland.....Ohio
Detroit.....Mich.
Chicago.....Ill.
St. Louis.....Mo.
Buffalo.....N. Y.
Newark.....N. J.
Knoxville.....Tenn.
Los Angeles.....Cal.
San Francisco.....Cal.

FIRTH-STERLING

FIRTHALOY

QUALITY

WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip.
Wire Products and Insulated Wire and Cable.
DRAWING --- ROLLING--- EXTRUDING --- FORMING --- FABRICATING

Vol. 12 JULY, 1937 No. 7

The Metallurgy of Steel Wire

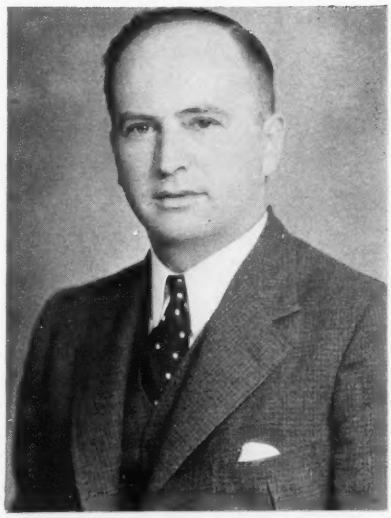
By B. L. McCarthy,
Chief Metallurgist, Wickwire Spencer Steel Company,
Buffalo, N. Y.

A paper given before the Pittsburgh Meeting of the Wire Association on May 21, 1937, presenting a general summary of the role the metallurgist plays in the production of steel wire.

THE word metallurgy, in its strictest sense and according to definition, means the art or science of separating metals from their ores. While this definition undoubtedly applied in the early history of metallurgy, when the problem of producing metals from their ores was less understood, the present usage of the term embraces a wider range of work. Today the word metallurgy is employed to cover smelting and refining treatments, the alloying of metals, heat treatment and metal working in general. In a sense, all metal workers, whether they are blacksmiths, heat treaters, melters or wire drawers, whether they peer through a microscope to study the microstructures of metal, or whether they peer through blue glasses to study the behavior of a molten bath of steel, are metallurgists.

✦ ✦ ✦

IN its present usage, the term metallurgist is confined to those who employ a technical knowledge of the elements and their behavior in the study of the present metallurgical problems and who, by virtue of special training, apply principles of chemistry, physics and crystallography in working out the solution of metallurgical problems.



BENJAMIN LEWIS McCARTHY

Born in Lockport, New York, in 1895. In 1913 was employed as Assistant Chemist by Simonds Saw & Steel Co. In 1916 was employed by Wickwire Steel Co., now known as Wickwire Spencer Steel Co., as Assistant Chief Chemist. Three years later was promoted to Chief Chemist and Metallurgist. Now in charge of the Chemical and Metallurgical Laboratories and directs research and special investigation into the Chemistry and Metallurgy of steel, steel wire and wire products. Member of the Wire Association, The American Society for Testing Materials, and the American Society for Metals. Awarded the Wire Association Medal for the most meritorious paper on wire manufacture or fabrication during the year 1935.

BECAUSE of the lack of time and space it would be difficult for us to discuss in detail the many problems which must be considered in a complete, detailed, description of the metallurgy of steel wire. In this paper I intend to present only a generalized summary of the role the metallurgist plays in the production of steel wire, reserving the details for more individualized studies.

✦ ✦ ✦

FOR many years the problems which confronted the wire drawer were considered wire mill problems, cuppy wire, slivers, wire low in ductility, low in torsion, poor bending, all were properties over which the wire mill was supposed to exercise control. More advanced studies, however, have shown that most of these problems are beyond the control of the wire mill operator. With this knowledge a new era in the history of wire drawing has begun. Because of the many obstacles which the wire drawer had to overcome in the production of good wire, he became an artisan, and as such, a valuable man in the wire mill. Today the individuality of the wire drawer, except for those qualifications of intelligent and efficient workmanship, has been replaced by controlled

Designated as Official Publication by the Wire Association

methods of steel making and heat treatment and a knowledge of metallurgy which enables us to predetermine the quality of the product.

✦ ✦ ✦

ANY attempt to establish standard practices in the wire mill in the past usually resulted in trouble. The prime reason for this was the fact that the wire or wire rod as supplied to the drawing room varied to the extent that individual coils might require individual attention.

✦ ✦ ✦

THIS condition presented certain handicaps in the estimation of costs, filling of orders and to the peace of mind of the workmen which could not be tolerated today. It is now possible, by the use of metallurgical knowledge of steel making, heat treatment and metallography, to establish fixed drawing practices to which we can successfully adhere.

✦ ✦ ✦

METALLOGRAPHY has played an important part in this development. By the use of the microscope, the structures which cause trouble can be analyzed and avoided in subsequent treatments. Heats of steel can be classified according to their ability to develop certain structures under fixed conditions of treatment and steel making practices adjusted in order to produce the desired quality.

✦ ✦ ✦

IN line with these developments, metallurgists working in other fields have developed suitable die materials which have contributed further to the standardization of wire drawing practices. It is not uncommon today to have dies made of cemented carbides which will increase the amount of wire that can be drawn through one hole by over 300 percent.

✦ ✦ ✦

Start of Steel Wire Metallurgy

THE metallurgy of steel wire begins with charging of the melting furnace from which the steel is produced. Inasmuch as nearly all the steel wire produced in this country is made in the basic open hearth furnace, we will consider only this melting practice in our discussion. Experience coupled with metallurgical study has shown that unless the Pig Iron employed as part of the basic open hearth metal charge is of the proper chemical analyses and unless it is of uniform composition within a reasonable range of analyses, it can by upsetting the normal melting practice, influence the quality of the steel being made. Even though the carbon, silicon, manganese and phosphorus present in the iron may be wholly or partially eliminated, their influence on the inherent qualities of the steel can be detected.

Figure 1. Basic Pig Iron Showing Graphite Unetched 100 X. ✦ ✦ ✦ ✦

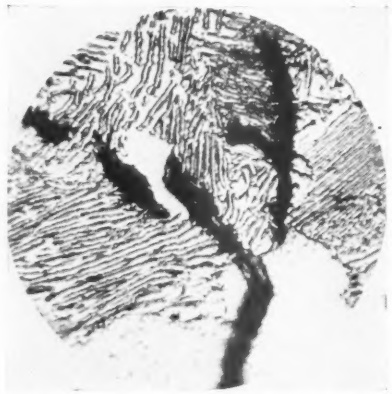


Figure 2. Basic Pig Iron Showing Pearlitic Structure of the combined Carbon Etched 2000 X.

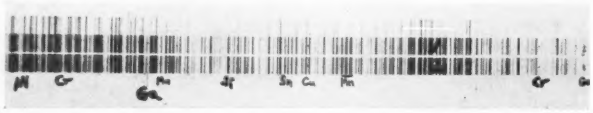


Figure 3. Spectrogram taken on two heats of Basic Open Hearth Steel. ✦

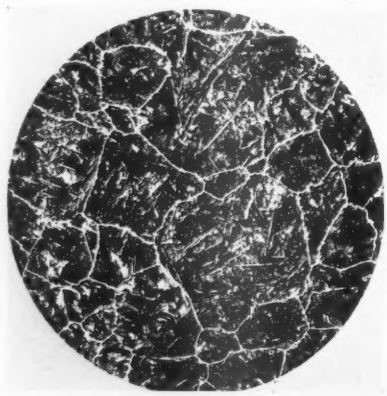


Figure 4. Coarse Grain Steel as determined by the McQuaid Ehn Grain Size test 100 X. ✦

✦ ✦ ✦

BELOW is shown a typical analysis of Basic Pig Iron for use in making steel by the Basic Open Hearth Process.

Silicon	1.00
Sulphur	.032
Manganese	2.25
Phosphorus	.250
Carbon Total	3.60
Carbon Combined	.38
Carbon Graphitic	3.22

✦ ✦ ✦

IN melting down, all of the silicon and nearly all the manganese and phosphorus are removed. At the same time the carbon is lowered to the desired amount whether it be .07 for low carbon steel or .70 for higher carbon material.

✦ ✦ ✦

BECAUSE of the small amount of variation in the total carbon content of pig iron, no special attention need be given to it. The amount of combined or graphitic carbon is not important. The combined carbon represents that portion which, because of the analyses of the iron and the rate of cooling, has combined with the iron to form iron carbide (cementite). The graphitic carbon is pure carbon uncombined with iron. In the Open Hearth, the reactions of both are the same.

✦ ✦ ✦

IN figure 1 is shown a photomicrograph of a sample taken

from a pig of basic iron. Note the graphite flakes; this sample is unetched. The combined carbon acts the same as the carbon in steel and produces, on slow cooling, the structure of pearlite. This is shown in figure 2.

✦ ✦ ✦

THE metal charge for the Open Hearth is composed of pig iron and scrap. Some of this scrap comes from the blooming mill and is ideal. A portion of each charge, however, is purchased scrap and the size and kind of purchased scrap being used plays an important part in the steel making practice. Because of the contamination by foreign elements such as copper, chromium, tin and other elements, the scrap available is becoming more impure. Some of the elements are present in such small amounts that they cannot be determined or detected by chemical analyses. Spectrographic analyses is being resorted to in studying the contamination of scrap, and by its use, elements whose presence would not be expected are being found.

✦ ✦ ✦

IN Figure 3 is shown a spectrogram of two heats of basic open hearth steel. One of these heats (marked #2) caused considerable trouble in patenting and it was difficult to produce satisfactory wire. The spectrograph marked #1 was for a good heat which caused no trouble. Note how the spectroscope has detected the presence of Gallium (Ga), Germanium (Ge) and Tin (Sn), all elements that we would not expect to encounter. Also have been found Silicon (Si), Manganese (Mn), Chromium (Cr), Nickel (Ni) and Copper (Cu). Although it is difficult for the inexperienced eye to detect the difference, the amounts of copper, chromium and tin are greater in #2 and in #1. This cannot be construed as sufficient evidence to justify a conclusion but it serves to demonstrate the part that metallurgical investigation can play in helping to solve these problems. Notwithstanding the small amounts of some of these elements, data is not available

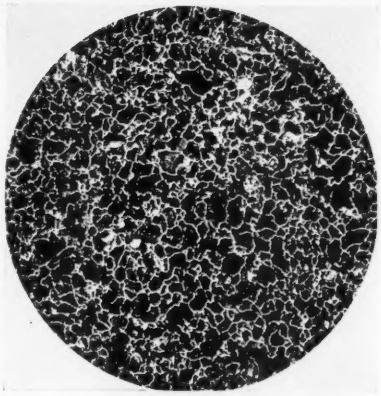


Figure 5. Sample of Fine Grain Steel as determined by the McQuaid Ehn Grain Size Test 100 X.

which will enable us, at present, to predict that their presence has no influence on the heat treatment.

✦ ✦ ✦

IN the same manner, the use of the McQuaid Ehn Grain size test has been very helpful in classifying various heats of steel for wire drawing. As shown in a paper presented before this association 1* in 1935, a coarse grain steel, as determined by this test, is preferred over a fine grain steel for the manufacture of cold drawn steel wire. In figure 4 is shown a photomicrograph of the grain size developed in a coarse grain steel. In figure 5 is shown a fine grain steel. Both of these structures were the result of carburizing the steel according to the McQuaid Ehn Grain Size Test for 8 hours at 1700°F. The use of this test gives a more uniform steel with regard to its response to the patenting treatment, and better results are developed. It is particularly noticeable that more uniform physical properties are obtainable by the use of coarse grain steel than were possible without this control. *See references

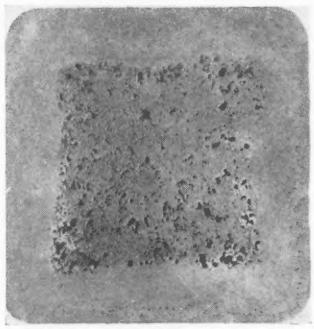


Figure 6. Etched cross section of a 1¾ Billet made by rimming process. ✦ ✦ ✦

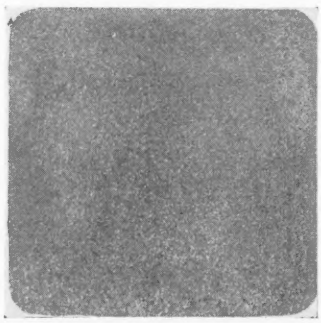


Figure 7. Cross section of 1¾ Billet from killed steel. ✦ ✦ ✦ ✦ ✦

✦ ✦ ✦

USING the McQuaid Ehn Grain size as a guide, the Open Hearth practices regarding melting down carbon, rate of carbon drop, deoxidation program, nature of the charge etc., have been studied and greater control developed. In the author's opinion, this method of evaluating steel for wire drawing purposes has been a great step forward in the metallurgy of steel wire.

✦ ✦ ✦

THE manufacture of low carbon steel for wire drawing requires metallurgical consideration as well as do the higher carbon steels. While, because of the difference in heat treatment, the McQuaid Ehn Grain size is not of importance in most cases, there are other points, such as the rimming qualities of rimming steel, the soundness of silicon-killed steel and surface, that require careful attention to obtain best results.

✦ ✦ ✦

RIMMING steel, which consists of a comparatively pure iron rim around a more impure center, is helpful in producing a high finish on soft wire and has a general application in the production of low carbon wire. Its relative purity and freedom from silicon makes it desirable for use in welding.

✦ ✦ ✦

SILICON-killed steels are stiffer and increase in hardness on cold working more than do rimmed steels. Silicon is particularly helpful in connection with galvanizing.

✦ ✦ ✦

IN figure 6 is shown an etched cross section of a rimmed steel

taken on the 1¾ billet. Note the purity of the rim as compared with the center. In figure 7 is shown a section of a killed steel billet; note the absence of the rim.

✦ ✦ ✦

OTHER special analyses of low carbon steels are employed for special purposes, such as free cutting steels which are high in manganese and sulphur.

✦ ✦ ✦

LOW carbon steel intended for carburizing and subsequent heat treatment may be produced with either coarse or fine grain, according to the McQuaid Ehn Grain Size Test.

✦ ✦ ✦

THE use of hot top bricks in controlling pipe and axial segregation is important together with care in pouring to avoid cold shuts and poor ingot surface.

✦ ✦ ✦

CONTINUAL work and study in connection with the surface, play an important part in the metallurgy of steel wire. This applies to both high and low carbon steels. The elimination of slivers, lap seams etc., requires studies of rolling and pouring practices. Chief among these offenders is the lap seam which may come from a cold shut in pouring, or the turning down of a sharp corner in rolling. It is usually of such depth as to be unaffected by the heat treating and cleaning, and may be drawn down without detection. Its presence is usually detected, however, in the final inspection or on fracture tests on the rods prior to drawing.

✦ ✦ ✦

IN figure 8 is shown a photomicrograph of a lap seam encountered in a ¼" rod. In figure 9 we have the same structure after etching. Note the decarburized area adjoining the defect.

✦ ✦ ✦

ALL the above facts serve to demonstrate the important part that metallurgical studies play in the making and rolling of steel for wire drawing.

✦ ✦ ✦

MOST of the low carbon steel is either drawn to size from the hot rolled rod or drawn to some size preparatory to annealing. Some

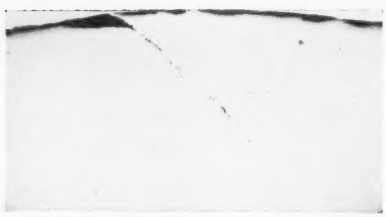


Figure 8. Lap seam found in ¼" Rod unetched 100 X. ✦ ✦ ✦ ✦ ✦

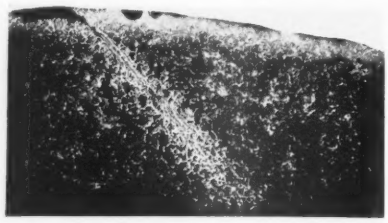


Figure 9. Same as figure 8 after etching. ✦

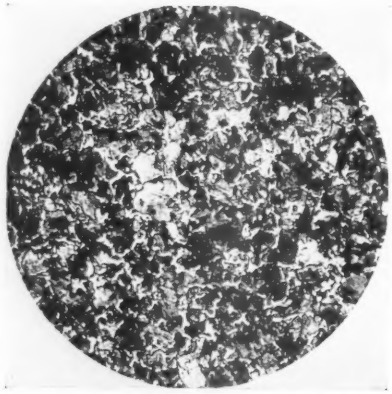


Figure 10. .62 carbon steel taken on #5 hot rolled rod—200 X. ✦ ✦ ✦ ✦

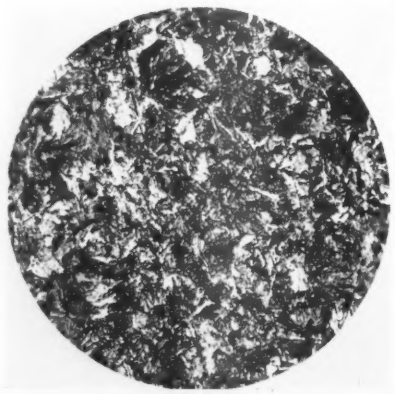


Figure 11. Same as Figure 10 after Air Patenting 200 X. ✦ ✦ ✦ ✦ ✦

low carbon material intended for cold heading purposes may be either annealed below the critical range or normalized at a temperature above the critical range. The anneal below the critical range is the more common in the wire mill having been in use for years. In this treatment, the cementite of the pearlite is divorced from the ferrite and appears in the structure in the form of rounded particles or spheroids. The normalizing treatment most frequently used on the intermediate carbon steels (.20 to .35), produces a coarse grain which promotes ductility and easy flow in cold heading.

✦ ✦ ✦

WE are all familiar with the patenting treatment which consists of heating the wire continuously to temperature in excess of the upper critical point, following by cooling in air, (air patenting), or lead, (lead patenting). In this treatment, non-uniformities of microstructure existing in the hot rolled rod are corrected and a uniform fine pearlite developed; (see figures 10 and 11).

✦ ✦ ✦

THE careful control of the patenting treatment and the production of desired physical properties and microstructure, prior to sending the material to the drawing room, is a most important part of the present day wire drawing procedure. Where, in the past, the drawing practices were adjusted to fit the condition of the stock, today the patenting procedure is adjusted to produce the desired condition in the stock. The control of steel making makes patenting simpler and less costly, and at the same time promotes wire quality.

✦ ✦ ✦

TEMPERED wire is produced by heating the wire continuously in either air or lead, quenching it in an oil bath, following by tempering it in hot lead. The sudden cooling in oil from above the critical point produces the structure of martensite, see figure 12. In the tempering operation, the iron carbide is precipitated out of solution, and appears in the structure in the form of rounded particles, see figure 13.

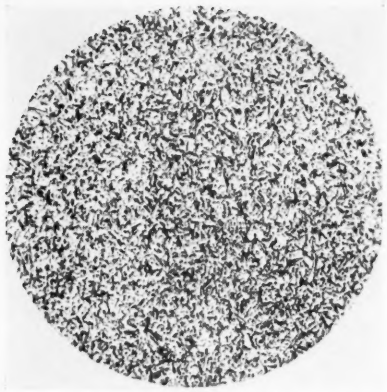


Figure 12. Structure of Martensite taken from .65 carbon wire after quenching in oil 100 X.

THE cold working of metals has been considered by the author elsewhere (2), and needs but general consideration at this time.

✦ ✦ ✦

THAT steel is composed of cubic crystals of iron which result from a definite geometrical arrangement of the atoms, has been definitely established; and, as has been shown, cold work produces slip along these crystallographic planes. When the wire is reduced in diameter by passing it through a die, there is a definite elongation of the grains and an increase in the amount of resistance developed against further deformation. This increase in resistance to deformation is interpreted in the wire mill in terms of increased tensile strength. In figure 14 is shown a drawing which is intended to portray the change in the microstructure of low carbon steel wire resulting from drawing.

✦ ✦ ✦

THE effect of wire drawing on the physical properties of steel wire depends primarily on the condition in which the material is prior to cold working, and, the size and number of drafts being employed. With a fixed condition in the unworked material, it is not a difficult problem to establish the influence of the size and number of reductions. In this manner the wire mill foreman is able to predict physical properties, and, by adjusting his drafting, establish a practice which will work out satisfactorily. If, however, a variable condition exists in the steel prior to drafting, or if, because of inherent properties in the steel, it does not uniformly respond to heat treatment, a degree of variation in resultant physical properties will exist that will require continual adjustment of drafting practice to produce good wire. At best, the

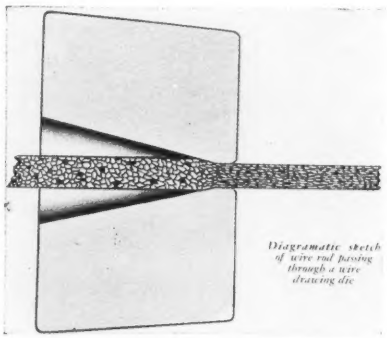


Figure 14. ✦ ✦ ✦ ✦

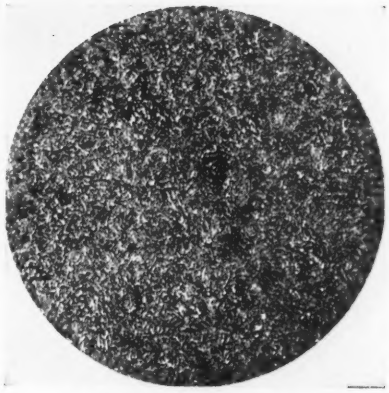


Figure 13. Same as Figure 12 after Tempering at 900°F.—100 X. ✦ ✦ ✦ ✦

percentage of good wire produced in this manner will be lower and its costs higher than that obtainable by the use of metallurgical control from the steel making down to the drawing bench.

✦ ✦ ✦

TO accomplish the above results it is not necessary that the metallurgist be closely tied up with operation. By establishing physical test specification for patented material and by the study of samples from heats of steel in the laboratory, standard procedures can be arrived at that will produce the required results.

✦ ✦ ✦

REFERENCES

(1)—"Grain Size and Its Influence on the Manufacture of Steel Wire" By B. L. McCarthy, WIRE & WIRE PRODUCTS Vol. 10—No. 9—September, 1935

(2)—"Plastic Deformation in Wire Drawing" By B. L. McCarthy, WIRE & WIRE PRODUCTS Vol. 11—No. 10—October, 1936

Make Your Plans Now To Attend

THE ANNUAL WIRE ASSOCIATION MEETING AND CONVENTION

To Be Held In Association With The

NATIONAL METAL CONGRESS

At ATLANTIC CITY, N. J. OCTOBER 18th to 22nd, 1937

There Will Be A Registration Fee of $5.00

Admission will be by Badge Only

Wire Association Holds Pittsburgh Regional Meeting

THE first annual regional meeting of the Wire Association was held at the William Penn Hotel, Pittsburgh, Pa., on Friday Evening, May 21st, 1937. The arrangements for the meeting were made by Mr. A. R. Zapp of the Firth-Sterling Steel Company, who acted as chairman of the committee in charge and the meeting was conducted under the direction of Mr. F. A. Westphal, superintendent of wire mills, Sheffield Steel Corporation, Kansas City, Mo., Vice-President of the Wire Association, who acted as Chairman.

✦ ✦ ✦

WHILE it had been expected that the meeting would be fairly well attended, the committee had not expected the large number who did come and who further engaged in a very active discussion of the papers presented. There were a total of 185 who signed registration cards and in addition many more who had previously attended the inspection visit to the new tungsten carbide plant of the Firth-Sterling Steel Company at McKeesport, Pa. in the afternoon, attended the meeting in a body in the evening.

✦ ✦ ✦

MR. Westphal, in opening the meeting, said —

"TODAY on every side business has picked up and there is some semblance of prosperity; however, each of us is confronted with a different spirit than that upon which we were raised from childhood. It causes some to become cynical when they themselves should be the inspiration of the business life of their particular sphere of industry and of their particular community.

✦ ✦ ✦

TODAY each of us fully appreciates the value of the elements concerning yields, conversion costs, quality of product, service to our customers and various commercial problems, or we wouldn't be here now. But rising well over the horizon is that newer and greater problem, namely human relations.

✦ ✦ ✦

HUMAN relations is not acquired from hearsay, nor in the proximity of mahogany row, nor in the smugness of clubs and hotels, nor in the sanctum sanctorum of political offices—but the understanding of human relations is acquired by working and living on the firing line of operations with the wage earner, whether it be in the mine or mill.

✦ ✦ ✦

OUR forefathers may have suffered, sacrificed and witnessed the striking of labor to its knees occasionally, but in spite of it all they built this country as free men. Within our time we have realized the abolition of the 12 hour shift, vast improvements in safety and welfare conditions, and the firm establishment and recognition of collective bargaining of employees. Progress has been made up to this time in human relations to the extent that fair play can be assured, otherwise the guilty, whether it be employer or employee, will surely have his "chickens come home to roost" on him some day.

A. R. ZAPP
Chairman of Committee for Pittsburgh Regional Meeting

Attended Franklin & Marshall College. The United States Naval Engineering School, and Stevens Institute of Technology. Served two years as Engineering Officer in U. S. Navy. Five years in the Research Division of the Allied Chemical and Dye Corp. Four years with the Reily-Stoker Corp. Three years with Union Wire Die Corp. From 1932 with the Firth-Sterling Steel Company as manager of the Firthaloy Division. Member, The Wire Association.

✦ ✦ ✦

THE spirit of today indicates that the pendulum is swinging too far over for labor. Employees and workers amongst themselves are using coercion and intimidation, and are forcing their fellow workers into organizations they do not want to belong to. Some workers feel that they are not free men, but must line up with those who demand the payment of tribute.

✦ ✦ ✦

ANY man has those rights that we and our forefathers fought and bled for, namely freedom. The mental life of today is propaganda, and the weaker, less intellectual and dumber are being misled by a lot of sour-pussed propagandists. It looks very much like labor shall awaken in the not too far distant future and realize they have been stupidly misled.

✦ ✦ ✦

THERE is an old fashioned word, namely loyalty. If we stop to analyze that word, we shall realize that the strength of loyalty lies only with strong character and strong men because they choose the better things before they will establish their unwavering loyalty.

✦ ✦ ✦

LET us not be cynical, but face the spirit of today and try to lead our fellow workers with that sense of loyalty to his fellow worker, his righteous and fair minded employer—and finally, loyalty to his home, country and God."

✦ ✦ ✦

MR. Westphal then called attention to the fact that all discussions were to be "off the record" and that members and guests were free to express themselves in open discussion.

✦ ✦ ✦

THE following papers were presented:

"The Metallurgy of Steel Wire" by B. L. McCarthy, Metallurgist, Wickwire Spencer Steel Co., Buffalo, N. Y.

"Cold Heading Problems" by C. L. Harvey, Metallurgist, Lamson and Sessions Co., Kent, Ohio.

both of which are published in this issue of "WIRE & WIRE PRODUCTS".

MR. McCarthy's paper was excellently presented, received and interesting thoughts were presented on making bolt steel, as well as some of the higher carbon wires. The discussion started right from the Blast furnace and Open Hearth through all the subsequent operations, and with a complete showing of Photo-micrograph slides. Many metallurgical points were covered that were enlightening to many of the members.

✦ ✦ ✦

THE value of grain size studies was discussed; also a number of questions pertaining to the use of the spectrograph in studying the impurities in steel.

✦ ✦ ✦

MR. Harvey of **Lamson & Sessions** gave an excellent paper, as well as presenting it very well, going into details of manufacture, all of which he illustrated with sketches and numerous samples that he brought along. Due to the acute interest in coatings, Kenneth Lewis put the pertinent question to Mr. Harvey as to what would assist the industry in further research to produce the best coating for achieving the cold heading operation and giving longer life to the tools. In the discussion, Mr. McCarthy went into detail on how to achieve chemically the test on the right kind of coating.

✦ ✦ ✦

THE matter of decarburization was widely discussed, and Mr. Harvey pointed out that in the photo-micrographs shown, one could discern the decarburization on the higher carbon specifications penetrating from .004 to .010 from the surface of the wire or bolt, that was decidedly injurious in attaining the proper strength on particular specifications for high carbon bolts. This is decidedly a field for thought and investigations, and it was suggested that the following procedure be carefully watched:

(a) Correct temperature in tapping bolt wire heats, taking care that it is not too hot in tapping and teeming temperatures.

(b) Correct determination of temperature at soaking pits should be ascertained, thereby making sure that ingots are not too hot previous to blooming, that might contribute to decarburization of the surface previous to rolling down to billets.

(c) Most important, however, it is believed that the correct temperature for rolling the billets to rods should be carefully watched. It was pointed out that decarburization on rope wire rods has been definitely ascertained and corrected by avoiding too high temperature in rolling rope wire rods. In turn it is believed that too high temperature in rolling high carbon bolt rods might contribute to this decarburization of the surface.

(d) Assuming the steel and wire producer has avoided surface decarburization up to rolling the rods and drawing the wire, it is believed that he should be absolved, providing he has close control in his normalizing or spheroidizing. Either of these two operations might contribute to decarburization, but without close metallurgical control on this operation it might be considered as guilty of contributing to decarburization.

✦ ✦ ✦

IN considering the thoughts jointly covered by the two papers, the following points were brought out:

(1) The use of Tungsten-Carbide tools in cold heading was discussed, and it was thought that visit and contact in the afternoon to the Firth-Sterling plant was beneficial. It is understood that greatly increased life is being attained with the extrusion tools in the cold heading operation, that makes a decidedly progressive step in this field by the use of Tungsten-Carbide over tool steel.

FREDERICK A. WESTPHAL
Chairman of Meeting
Superintendent of Wire Mills, Sheffield Steel Corp., Kansas City, Co., Vice President, The Wire Association.

(2) The matter of coatings on bolt wire was very widely discussed by numerous members, many of whom seemed to take diametrical positions with others in relation to having the correct balance of sull and lime coating. From the discussion it indicates that each steel and wire maker furnishes each respective bolt maker some slight variation to satisfy his customer's desires. It appears that the correct balance of sull combined with a heavy or extra heavy lime coat, plus the correct speed of drawing, and lastly, the proper proportion of dehydrated lime with a highly refined beef tallow base soap, that this is the crux of the success of a good coating for the bolt maker.

✦ ✦ ✦

MR. C. L. Harvey's talk on wire for cold heading was a pleasant surprise in every way. We knew he had it but we didn't know he could dish it up so smoothly. Not even the public address system could bother him. Whatever has been keeping Mr. Harvey off the floor at our technical sessions must be discovered and fixed up. Speaking apparently without notes, and never at a loss for a word, he reviewed the problems common to the wire mills and the cold heading plants, and tossed in a series of questions and problems for discussion. The discussion, which carried these points fairly adequately and ranged over allied topics, kept Mr. Harvey on his feet for a considerable time.

✦ ✦ ✦

HONORABLE mention should be given the following for very pertinent and timely ideas advanced in the discussions:

Dr. S. A. Braley, Pittsburgh Steel Co., Pittsburgh, Pa.

Dr. L. H. Winkler, Bethlehem Steel Co., Bethlehem, Pa.

Mr. John A. Moritz, Keystone Steel & Wire Co., Peoria, Ill.

Mr. H. W. Haarbauer, Townsend Co., New Brighton, Pa.

✦ ✦ ✦

THE meeting was considered to be highly successful by all who attended and as a result will be established as an annual meeting to be held under the direction of the Pittsburgh members of the Association.

Flash Baking of Wire and Rods

Describing the Flash Baker, a new development that has taken place in connection with pickling and baking of rod wire and which reduces both the requirements and the cost of the baking operation. ✦ ✦ ✦

AN article in a recent issue of this magazine, (Sept. 1936) traced the history of rod baking, and called attention to recent advances in practice centering around the application of heat to the rods and tending to improve as well as hasten the process. Since the publication of that article a further step has been taken, and its success warrants a further review of our scanty stock of knowledge. The new unit, called the "flash baker" seems to violate many beliefs, and as its success seems to be firmly established we must re-examine our beliefs.

✦ ✦ ✦

IN the earliest baking chambers the temperature was mild, the atmosphere nearly stagnant, and both drying and baking were very slow. The first improvement was in the direction of higher temperatures and a slow movement of air, encouraged by simply providing vents through which gravity could act. A further change brought turbulence to the atmosphere by the use of fans. Following this improvement came a series of true convection bakers in which clean preheated air, generally recirculated, was forced thru the baking chamber at a speed which caused from 1 to 4 complete changes per minute. During these developments, the baking time dropped to less than one quarter its early value, and quality became steadily more dependable.

THESE bakers were all of the indirect fired type, in which only clean air was admitted to the chamber, and the products of combustion had no opportunity, unless by reason of accidental flue leakage, to affect the steel or the lime through the action of their acid-forming constituents. The article mentioned above referred to a baker in which the flame itself, greatly diluted, formed the oven atmosphere, and suggested that in all probability the expulsion of moisture from the lime was so rapid that the gaseous oxides had no time to form acids.

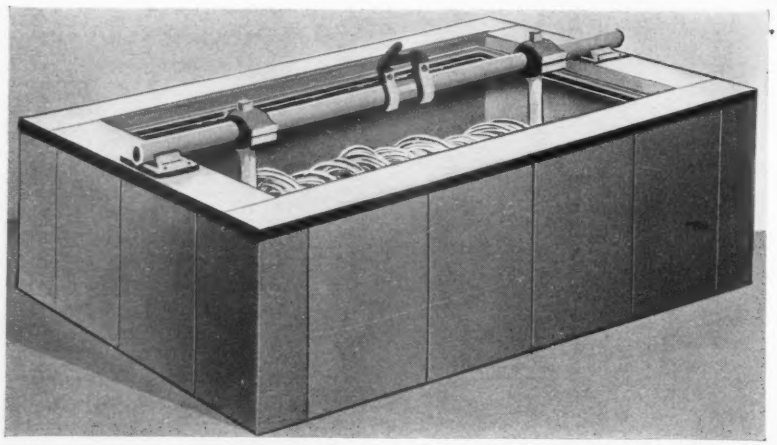
✦ ✦ ✦

Effect of Temperature and Velocity

IN the new flash baker the vital factors, temperature and velocity have been drastically raised. The air stream enters the chamber at 750°F. at a velocity at least twenty times as high as ever used before. Means are adopted to apply the atmosphere exactly where it is needed. The rather astounding result is a baking period ranging from 20 seconds to 6 minutes, depending on the amount of lime, and the size and carbon of the wire.

✦ ✦ ✦

AS the accompanying illustrations show, the salient features of the flash baker are its shape, and its location with respect to the cleaning facilities. It is in effect a rectangular open-top chamber, of the same size and shape as the lime tub, shaped, sized and positioned to take a pin of rods direct from the lime. The yoke rests on the edges of the chamber, and the ends of the hollow cylinder formed by the suspended rods register with ducts through which hot air is discharged at high velocity. These two air streams meet; a presence is built up, and the air is forced out through the massed coils. Along the sides of the chamber are pick-up ducts, through which the spent air returns to the combustion chamber, is reheated, refreshed with new air to support combustion and recirculated thru the rods. The moisture is driven out of the lime with almost explosive violence, some loads appearing to dry before the crane can be unhooked.



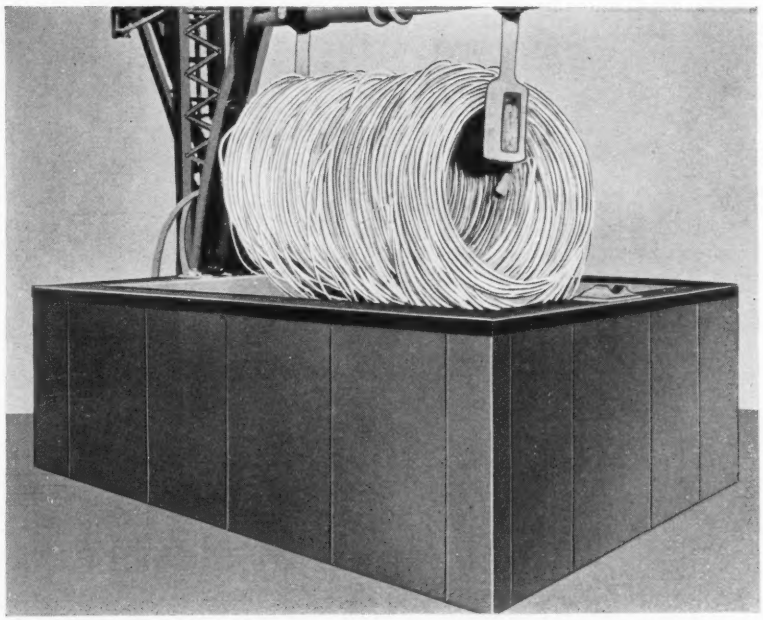
New Flash Baker (Courtesy Morrison Engineering Co., Inc.) ✦ ✦ ✦

Air Curtain

TO minimize the loss of heat from the open top a curtain of cold air is provided. Narrow slots along the top edges of the vat discharge cold air at high velocity, which effectively blankets off the hot gases below.

✦ ✦ ✦

THE first installation started on nail stock, worked on through fence wire, bright basic market wire, special bright finishes and heavily coated bolt stock, and then successfully handled process wire down to 18 gauge. Finally patented spring rods and wire were successfully processed. Success on low carbon jobs is readily understandable; the intelligent use of inhibitors has largely suppressed acid brittleness, and high temperature and velocity might logically be supposed to have a powerful effect on drying time. Spring wire is another story, and one in which nothing is entirely clear except the happy result. A recent research by a young Canadian student, reported in these columns, showed the degree of recovery from pickling brittleness in a given time is a direct function of temperature. His work was carried on at temperatures rising to about 450. It may well be that the recovery curve bends sharply at higher temperatures.



Flash Baker (Courtesy Morrison Engineering Co., Inc.)

✦ ✦ ✦

High Carbon Wire

THEN again, recovery from acid brittleness involves the actual escape of hydrogen through the surface of the rod. We are familiar with the effect of agitation of the acid by compressed air, and agitation of the rods, in the acid, in detaching hydrogen bubbles as fast as they form, and the resulting acceleration of pickling action. It is not inconceivable that some analogous effect is obtained by a rapid circulation of hot air across the baking surface, in fact a violent wiping of the surface by pressure air. We know that the convection baker, now well established, expels hydrogen in one half to one quarter the time formerly required at the same temperature. The flash baker simply carries this effect further. Whatever the mechanism, the effect is beyond dispute; the plant metallurgists have been unable to trace into the drawn wire any effects of the unusual baking.

✦ ✦ ✦

Operating Features

AS the salient features of the flash baker are its odd shape and its location, so its chief advantage is that it makes baking a part of the cleaning operation — just another pick-up for the craneman. The baker is set in the cleaning line or circle, beside the lime tub, and the craneman discharges rods ready to draw. In a cleaning house whose crane is kept pretty busy to meet the schedule, two bakers side by side permit the crane to hold to its regular cycle. Limed rods drop into the empty baker, baked rods drop onto the truck, and the crane returns to pick up a lift of new rods. It is probable that two pin spaces will serve any line or circle, but if a cycle is being maintained which is less than the required baking time a third pin-space will allow the baking time to be twice the crane cycle. In other words, if A is the cycle, that is, the number of minutes between the discharge of successive loads of limed rod, and B the time ascertained to be the maximum baking period, the number of pin spaces required will be

$$\frac{B}{A} + 1.$$

This ensures maximum efficiency.

✦ ✦ ✦

Fuel Cost

FUEL cost is running about five cents per ton, with certain avenues of economy still unexplored. The fuel may be gas or oil. Oddly enough, and yet strictly logically, the composition of the fuel has no effect on the product. The first installation has run interchangeably on natural gas and a very sulphurous coke-oven gas with no noticeable difference. It appears that the gas cannot affect dry lime or dry steel, and these are dried in a small fraction of a minute.

✦ ✦ ✦

Advantages

THE first installation has aroused much comment and many wire men have looked it over. In addition to the obvious savings in labor, floor space, and fuel, it is believed that special advantages may be expected in two classes of product, (1) extra bright wire,

(*Please turn to Page 385*)

A Milestone In Metallurgical Progress

(A Story of Sintered Carbide)

A description of the new Firthaloy sintered carbide plant of the Firth-Sterling Steel Company of McKeesport, Pa., together with an outline of processes used in producing sintered carbide wire drawing dies, mandrels, tools, etc. ✦ ✦ ✦

THE opening of the new Firthaloy Sintered Carbide plant of the Firth-Sterling Steel Company, McKeesport, Pa., quite appropriately marked the tenth anniversary of the company's first experience with this unusual form of metal, which for many wire mill applications has been found to supersede in performance commercial diamonds, the forged die steel and cast die alloy.

✦ ✦ ✦

THE date of the opening of this new plant coincided with the regional meeting of the Wire Association which was held at the William Penn Hotel on the evening of May 21, and as a result a great number of customers and friends of the Firth-Sterling Steel Company visited the plant and inspected its production facilities very thoroughly.

✦ ✦ ✦

THE concensus of opinion was that this plant marked the very latest development not only in commercial structures but in plant layout for the production of the finished sintered carbide dies.

THIS new plant affords one of those rare instances when a building looks better in reality than in the advertising. Located in industrial surroundings of perhaps more than ordinary dinginess, the new building in its setting of fresh green lawn and shrubbery stood out like a gem. Within, it seemed admirably adapted to its purpose and equipped in the most thoroughly modern way. The use of glass brick was especially interesting.

✦ ✦ ✦

FOLLOWING the plant inspection there was an informal dinner given by the Firth-Sterling Steel Company to its guests and visitors, at the William Penn Hotel. At this dinner Mr. Gerald Firth, president of the Firth-Sterling Steel Company, welcomed the visitors with a short address. Among other things, Mr. Firth made the comment that the thing about the Wire Association that impressed him was that the members are so clannish. The willingness to exchange information and ideas, Mr. Firth continued, is a splendid thing and without doubt works to the best interests of the Association. He also congratulated Mr. Brown on the remarkable progress made by his paper, Wire & Wire Products. Not only is this paper attaining a very fine national reputation but it is also rapidly becoming an international authority on everything pertaining to the manufacture and use of wire and wire products.

✦ ✦ ✦

Building Designed to Meet a Specialized Production Problem

THE development and manufacture of this product have presented innumerable problems for

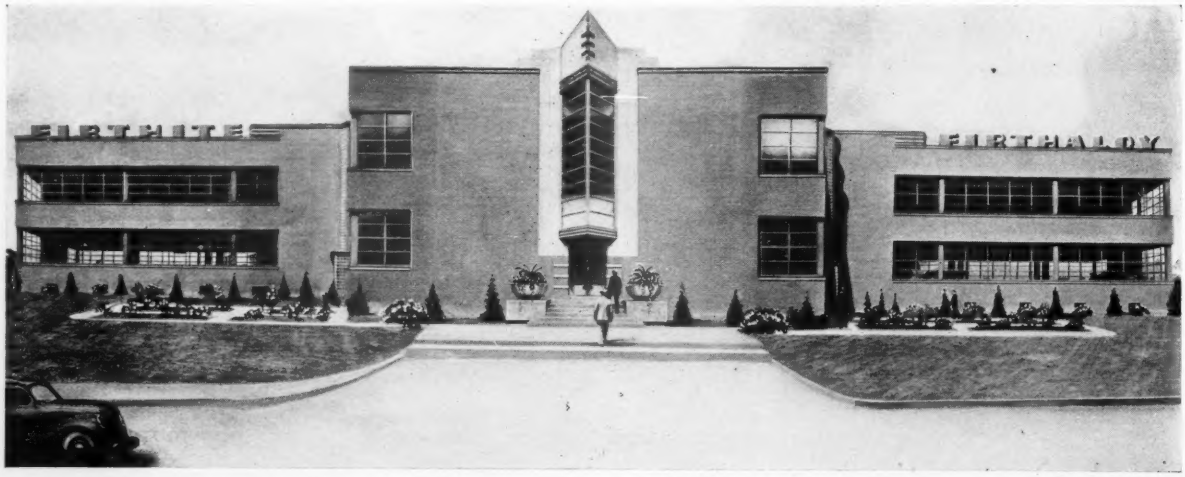


Fig. 1 Front view of the new Firthite-Firthaloy Plant. ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦

Fig. 2. Foyer and Display Room—Flush wall cases contain finished Firthaloy tools and dies. Also flow models describe production processes from ore to finai sintered carbide.

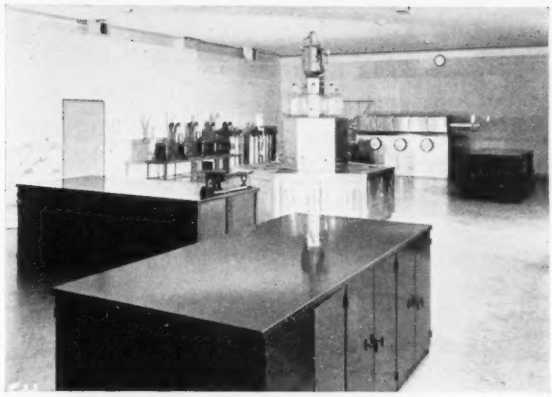


Fig. 3. A general view of the mixing room where powders are prepared prior to being sent to drying ovens. Note the filtering sink used for filtering liquids from the charges.

which, at the outset, the solution seemed simple, but which have involved much patient research work.

✦ ✦ ✦

and a wire plant of the company. Its sharp contrast to these surroundings is no greater than the difference between the processes and products of the new plant and the tool steel mill.

✦ ✦ ✦

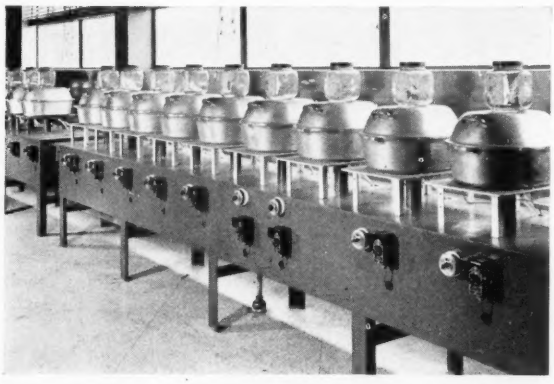


Fig. 4. Battery of baking ovens where powders are dried prior to pressing.

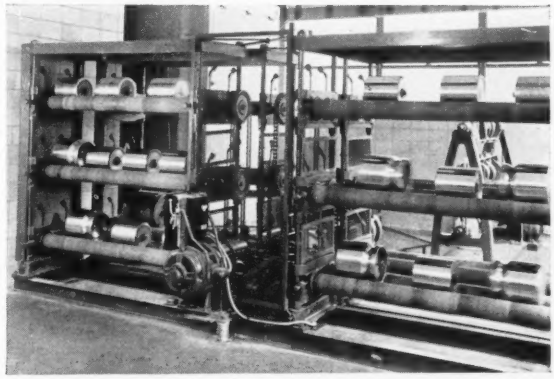


Fig. 5. A view of the ball milling room showing some of the units in operation.

THE new building has been designed to permit efficient and orderly production and the elimination of wasteful handling of materials and time losses. Many departments have been equipped with the most modern machinery and equipment, essential to the intricate processes of manufacture of the product.

✦ ✦ ✦

WHILE the method of manufacture is simple in principle, an analysis of the step by step process followed in the new plant shows why it has taken 10 years to bring the Sintered Carbides to their present state of development.

✦ ✦ ✦

THE modernistic building itself, with its gardened approach, is located between the drab steel mill

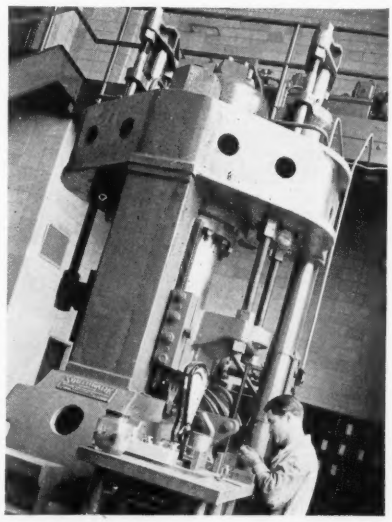


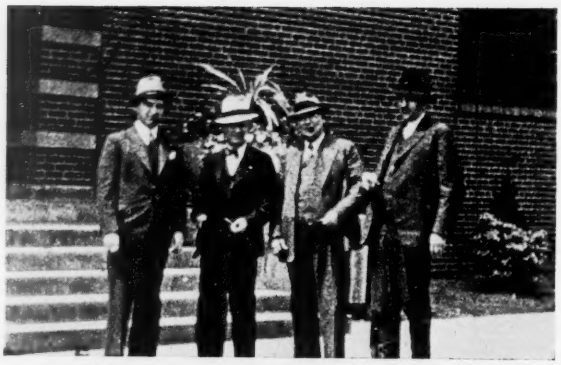
Fig. 6. A view of the 400-ton two-way press where powders are compacted into the shape approximately 20 per cent larger than the finished blanks or nibs. Pressures range from 4,000 to 60,000 pounds per square inch of surface.

IN the new building, the latest materials for industrial constructions have been used;—aluminum, glass-brick, stainless steel, cork, wood-block flooring, Carrara glass walls,—all with two aims in view, namely, the best possible working conditions for the men and absolute cleanliness of the product. A single particle of dust, dirt or foreign material may cause a defect and the rejection of an otherwise perfect tool or die.

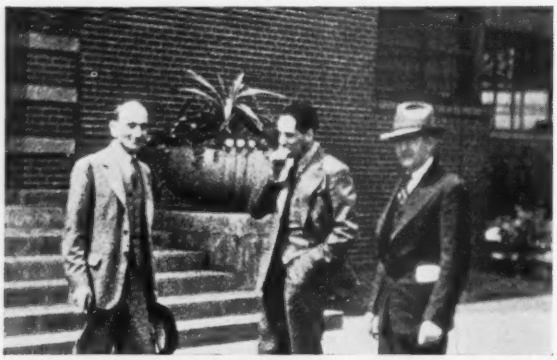
✦ ✦ ✦

UPON entering the building one passes through a hallway formed by glass-brick partitions, directly into the lobby. Here are displayed cases containing a variety of finished tools and dies as well as specimens of Ferberite ore (Iron tungstate). This ore is mined on

C. F. Hershey, Union Drawn Steel Co.; J. S. Lynch, Union Drawn Steel Co.; J. W. Middelker, Union Drawn Steel Co.; F. Chapman, Firth-Sterling Steel Company. ✦ ✦ ✦

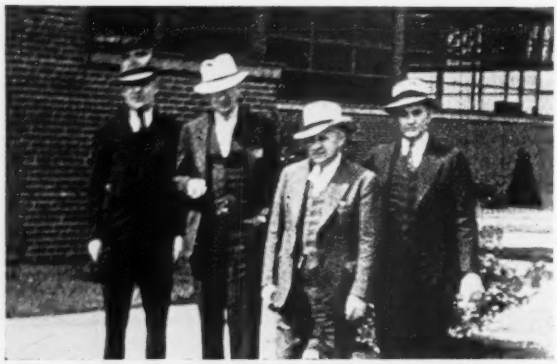


L. H. Winkler, Bethlehem Steel Company; B. L. McCarthy, Wickwire-Spencer Steel Co.; W. F. Schultz, Firth-Sterling Steel Company; P. A. Beaman, Morgan Construction Co. ✦ ✦ ✦



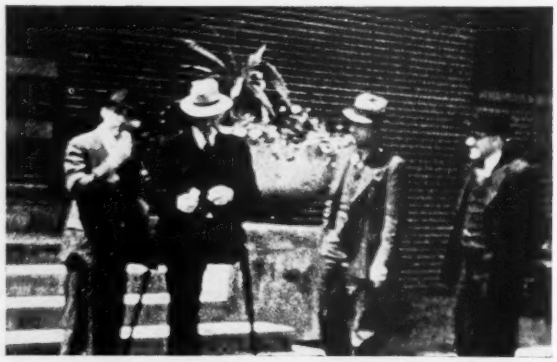
F. Magidson, Pittsburgh Cut Wire Co.; W. J. McInerney, Pittsburgh Crucible Steel Co.; H. F. Longnecker, Firth-Sterling Steel Co. ✦

A. R. Zapp, Firth-Sterling Steel Company; G. A. Hildenberger, Bethlehem Steel Co.; R. E. Brown, Wire and Wire Products; J. A. Welch, Firth-Sterling Steel Co. ✦ ✦ ✦



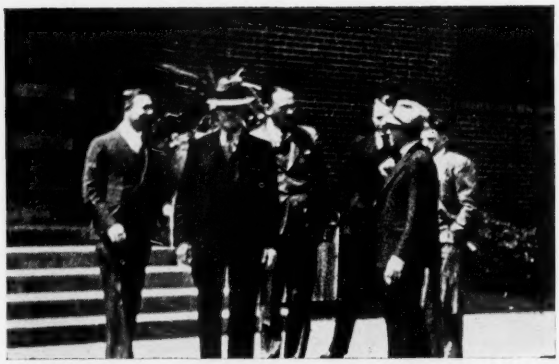
J. J. Zimmer, Columbia Steel & Shafting Co.; H. M. Mateer, Columbia Steel & Shafting Co.; J. J. Stanko, Columbia Steel & Shafting Co.; H. M. Brightman, Columbia Steel & Shafting Co. ✦ ✦

L. G. Firth, Firth-Sterling Steel Company; J. S. Witherspoon, American Steel & Wire Co.; J. A. Slenker, American Steel & Wire Co.; J. S. Richards, American Steel & Wire Co. ✦ ✦



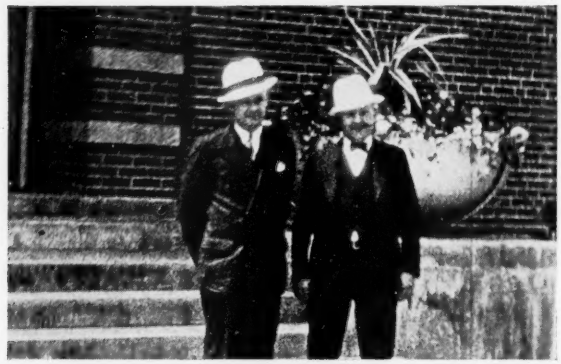
C. L. Harvey, Lamson & Sessions Co.; H. Ladel, Lamson & Sessions Co.; A. Jackman, Firth-Sterling Steel Co.; P. E. Dimling, Firth-Sterling Steel Co. ✦ ✦ ✦ ✦ ✦

Between 125 and 150 of the leading production men of the wire industry attended the opening of the new Firthaloy Sintered Carbide plant of the Firth Sterling Steel Company at McKeesport, Penna., on May 21, 1937.



F. A. Westphal, Sheffield Steel Corp.; L. C. Crewe, Bethlehem Steel Company; S. Cox, Bethlehem Steel Company; H. W. Elias, Firth-Sterling Steel Company; G. W. Frick, Firth-Sterling Steel Company.

K. B. Lewis, Consulting Engineer; N. Davidson, Sir James Farmer Norton & Co. Ltd.; H. Nowell, Sir James Farmer Norton & Co. Ltd.; R. W. Sandelin, Atlantic Steel Co.; E. E. Martin, Warner Company.



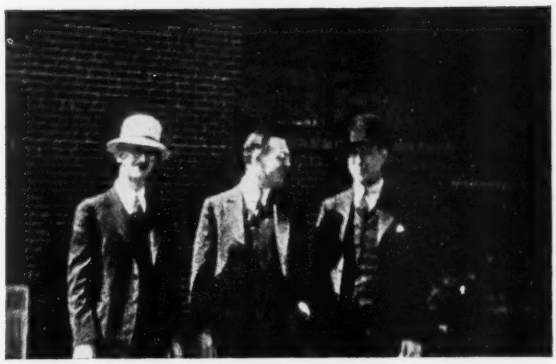
C. H. Pflegher, Union Drawn Steel Co.; E. V. Mallick, Union Drawn Steel Co. ✦ ✦ ✦ ✦ ✦ ✦

W. Fassinger, Oliver Iron & Steel Co.; A. Spulher, Oliver Iron & Steel Co. ✦ ✦ ✦ ✦ ✦

J. M. Hourigan, Aluminum Company of America; A. R. Callender, Aluminum Company of America. ✦ ✦ ✦

D. H. Keyser, Washington Navy Yard. ✦ ✦ ✦

The "amateur photographer" was very much on the job. We show here some results of his efforts at "candid photography." Some of the results are "candid" enough to satisfy anyone!



H. W. Passolt, Page Steel & Wire Co.; J. E. Bott, Page Steel & Wire Co.; J. J. Maher, Page Steel & Wire Co. ✦ ✦ ✦

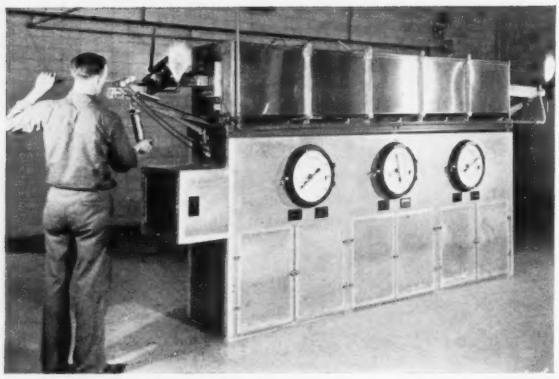


Fig. 7. Charging pressed billets into a low temperature sintering furnace which is automatically controlled for temperature flow of hydrogen and stoking speed. ✦ ✦ ✦ ✦

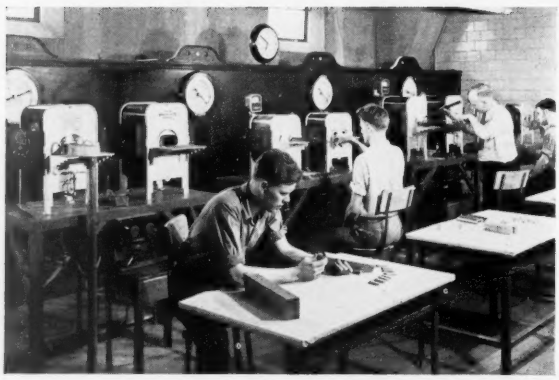


Fig. 9. Brazing Department — Here Firthite tips, which form the cutting edge of tools, are attached to strong steel shanks. Pure copper is used as a solder, and brazing is accomplished in the furnaces shown in the photograph. Temperature is maintained at 2,050 degrees F.

the company's properties in Colorado, by the Wolf Tongue Mining Company, a wholly owned subsidiary. The tungsten is put through a chemical process of refinement in the company's laboratory in McKeesport.

✦ ✦ ✦

The Manufacturing Process

THE first step in the manufacturing process is the carburizing of the powders after which they are transferred to the mixing room. In this room provision has been made for the maintenance of absolute cleanliness, essential to the manufacture of the product. The walls are of Carrara glass; the ceiling and floors of waterproof material; the bench tops of steel; and the equipment throughout is of material that can be washed and cleaned readily in order to eliminate the danger of the powder being contaminated. Carburizing is accomplished by heating a mixture of carbon powder and metallic tungsten powder to a high temperature in a non-oxidizing atmosphere. The resultant carbides are crushed by ball milling and returned to the mixing room where they are combined with tantalum carbide, titanium carbide, and cobalt powders. These are then mixed in various proportions to produce the different grades.

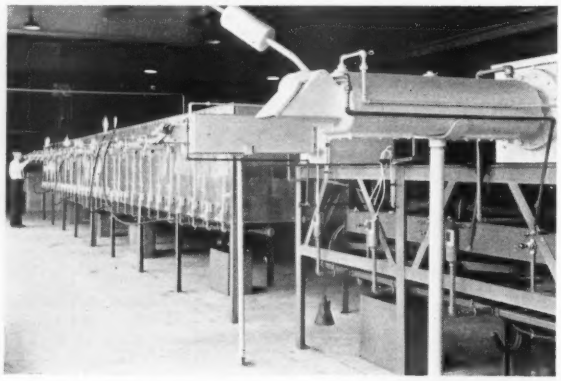


Fig. 8. One of a battery of high temperature hydrogen atmosphere sintering furnaces. ✦ ✦ ✦ ✦

✦ ✦ ✦

IN a stainless steel filtering sink, located in the center of the room, distilled water is added to the charge, or mix. Later the milled charge is brought back and the greater part of the water filtered off. After filtering, the powder is dried in thermostatically controlled baking ovens, mixed with cobalt powders, and delivered for a final ball milling.

✦ ✦ ✦

THE ball milling room is quite different from the mixing room. Here the process is entirely mechanical. The containers are put upon machines of special design in which the charges are rolled or tumbled continuously for days.

Fig. 10. Firthaloy Die Shop. ✦ ✦ ✦ ✦

Fig. 11. Shaping a Firthaloy die. ✦ ✦ ✦

Fig. 12. A close-up of a grinding machine for shaping angles on tips while in chalk-like state.

Fig. 13. A general view of shaping department, showing men shaping some of the more difficult tips and nibs which is done entirely by hand.

ANOTHER purpose of milling is to coat the hard particles of carbide with a metal binder such as cobalt. To do this the milling or rolling must continue until every particle is coated to an extent that will give the desired binder content in the finished product. When the milling is complete, the charge goes back to the mixing room where all trace of water is removed.

✦ ✦ ✦

IN the manufacture of Firthaloy, these ball mill batches are comparable to the "heats" of the steel mill and the identity of each is preserved throughout the process so that the mill number upon a completed die permits tracing of the material back through every step to the mixing of the powders.

✦ ✦ ✦

THE powder mixture then goes to a two-story room containing a 400-ton two-way press for large production pieces, and a small press for compacting smaller units such as individual nibs. Here the proper quantity of powder mixture is weighed in accordance with the piece to be pressed and the mixture is then spread uniformly in a mold or die. So as to allow for a surprising shrinkage in all dimensions in the final sintering, all molds are made in sizes and shapes to produce pieces approximately twenty per cent larger than the finished product. The molds are of a type which can be completely disassembled without affecting in any way the compacted blank which is very fragile in spite of the great pressure to which it has been subjected. Pressures range from 4,000 to 60,000 pounds to the square inch of surface depending upon the type of material and the size and shape of the blank.

✦ ✦ ✦

THE next step is to give the compacted piece a preliminary heat treatment. It is put through a "pre-sintering" furnace having three electrically heated sections in which a hydrogen atmosphere is maintained throughout. Temperatures are indicated on large dial pyrometers. The fragile blocks are placed upon graphite slabs and heated to a temperature at which the metal particles coalesce and make a somewhat less fragile piece with a chalk-like hardness. The piece when cooled is then ready for shaping.

✦ ✦ ✦

IN the shaping room, glass walls have been installed as well as easily cleaned floors and ceiling. In this department the atmospheric problem is to keep the air clean for the benefit of the workers. Every mechanical shaping device is equipped with exhaust fans to remove all particles of fine dust produced by cutting the rectangu-

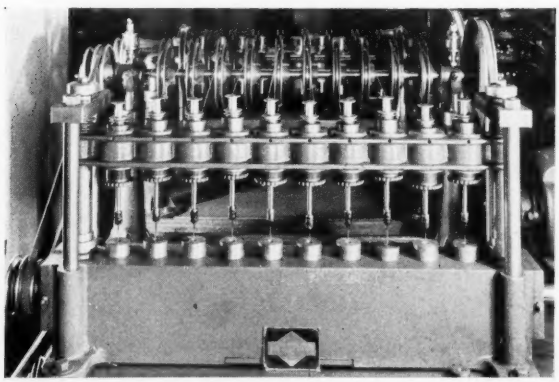


Fig. 14. Battery of 6—10 head drillers. Ordinary steel sewing needles, with diamond dust and olive oil, drill holes smaller than human hair. (Hole at back of die nib can be pierced as small as 0.002 thousandths of an inch. ✦ ✦ ✦ ✦ ✦

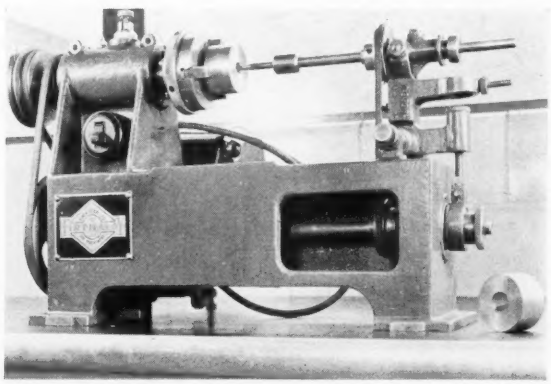


Fig. 15. Firthaloy Automatic Polisher and hand finishing dual unit. Steel needles revolve and rock in and out, following predetermined contour inside the nib. Diamond dust and olive oil do the cutting and polishing. ✦ ✦ ✦ ✦ ✦

lar and cylindrical blocks to the varied shapes and sizes used in wire forming tools and dies.

✦ ✦ ✦

WHEN the piece is shaped it is ready for sintering, the process of heating to the melting point of that metal in a compound which melts first, and thus becomes a binder for the other unmelted particles. Special furnaces have been designed and built for the sintering process in order to insure a hydrogen atmosphere. The heating chamber of these furnaces is an alundum tube, wound with a resistance wire (molybdenum) which permits accurate control of temperature. A water cooled section adjoins the heating tube so that rate of cooling is also controllable. The shaped pieces are packed in carbon "boats" with carbon powder for uniform heating. The boats are introduced in a preheating section of the tubular furnace and then mechanically stoked or pushed through the heating and cooling sections, always in a hydrogen atmosphere. After sintering, the pieces have attained their final hardness and are ready to be used in a tool or die.

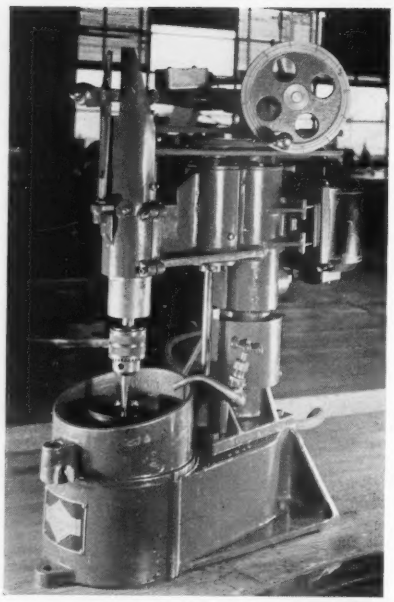


Fig. 16. Firth-Sterling high speed, heavy duty drilling machine used for roughing out holes in Firthaloy dies.

✦ ✦ ✦

EACH six-pound batch is carefully controlled for hardness, specific gravity, resistance to cross breaking stress, and microscopic structure.

✦ ✦ ✦

THE carbides are then sent to the die department where the nibs are mounted in casings and are either rough drilled or converted into finished dies, according to customers' requirements. The rough drilled dies are supplied to those wire drawing plants who are equipped on a smaller scale to finish and recut the dies themselves. The Firthaloy die department is equipped with machines specially designed to drill, shape and finish Firthaloy Carbide Dies in the many shapes and types required by the ever increasing use of drawing as a means of shaping metal.

✦ ✦ ✦

THE Brazing Department is of great importance to the die department because it is in this division that the Firthaloy tips and parts for wear-resistant applications, such as spring and wire forming tools, etc., are usually mounted in a holder or shank, and the accepted method of securing these tips is by brazing. Specially designed, electrically heated, hydrogen atmosphere furnaces are used. These furnaces are also sold to customers who make their own tools. Copper is the preferred brazing material, although for some purposes tips are fixed with "silver solder".

✦ ✦ ✦

TYPES of tungsten carbide supplied for wire drawing or forming are called Firthaloy. Wear resisting parts can be made either of Firthite or Firthaloy, and offer an undeveloped but extensive field for the use of sintered metal products.

✦ ✦ ✦

SINCE tungsten carbide dies were introduced in this country, they have brought about changes in machine design, improvement in mill processes and made possible the commercial use of new materials. Although the selling price of sintered carbides has been from $200 to $400 a pound and seems extremely high, the net result of the growing use of this new material is to reduce the cost of many necessities and luxuries bought by individuals as well as the equipment supplied or bought by industrial institutions.

Fig. 17. Physical testing and shipping department.

✦ ✦

Fig. 18. Foreground — Setting sleeve gauges on drilling needles. Left of Center — battery of heavy duty drillers and rippers in operation.

COLD WORKING OF METALS FINISHED PRODUCTS

Cold Worked Metals + + + Cold Formed or Machined Products + + + Cold Heading

1. Metallurgy and Research
2. Processes and Machinery of Production
3. Cold Heading
4. Cold Forming and Finishing Operations
5. Extruding

Vol. 12 JULY, 1937 No. 7

Cold Heading Problems

By C. L. Harvey

Chief Metallurgist, Lamson & Sessions Co., Kent, O.

A discussion of wire suitable for cold heading and the mutual problems of the wire producer and the manufacturer of cold headed wire products. A paper presented before the Pittsburgh Regional Meeting of the Wire Association, May 21, 1937.

MEMBERS of the cold-heading industry and the Wire Association have at least one common interest, namely, the production of wire suitable for cold-heading. Therefore, I feel that a discussion of the changes that have occurred in the industry in the last few years and the problems that have arisen from these changes will be of mutual benefit.

+ + +

AT the close of 1936, there were approximately 106 concerns actively engaged in the production of cold-headed parts. While it is difficult to get their total volume of sales accurately, it has been estimated by one authority as $61,000,000 annually. It is still more difficult to get accurate figures on the tonnage of wire and rod consumed but 650,000 tons annually is probably a conservative estimate. From these figures it can be seen that the cold heading field is of considerable magnitude and that its requirements should be given consideration. (See Table I).

UNTIL the last decade the header man was in the "doldrums" as far as new principles were concerned. Heading equipment and the necessary secondary machines had been improved mechanically over those used by our grandfathers but the fundamental principle was the same, namely, a piece of wire held in a solid or split (open) die and the head formed on the free end by one or more blows of suitably shaped hammers.

+ + +

TABLE I

SHIPMENTS OF THE BOLT, NUT AND RIVET INDUSTRY

Year	Tons	Sales
1927	585,000	$75,000,000
1928	600,000	80,000,000
1929	736,000	95,000,000
1930	526,000	65,000,000
1931	312,000	36,000,000
1932	173,000	19,000,000
1933	272,000	30,000,000
1934	308,000	37,000,000
1935	360,000	42,000,000
1936	535,000	61,000,000

BY the process of trial and error over a long period of years the suppliers of raw materials had developed products which met the requirements of the headerman.

+ + +

BUT within the past decade, several new principles and processes have been developed which completely change this picture. New demands have been made on raw material sources, and to date have been only partially met. It is these that I would like to discuss.

+ + +

THE first of these, is wire finishes suitable for single and double extruding. In the single extrusion process, (Fig. I) as developed by Kaufman, wire of nominal diameter instead of pitch diameter is pushed into a solid heading die and a portion of the blank reduced in cross sectional area. The head is then upset in the usual manner. In this process the reduction in area of the extruded portion varies from 20% to 30%.

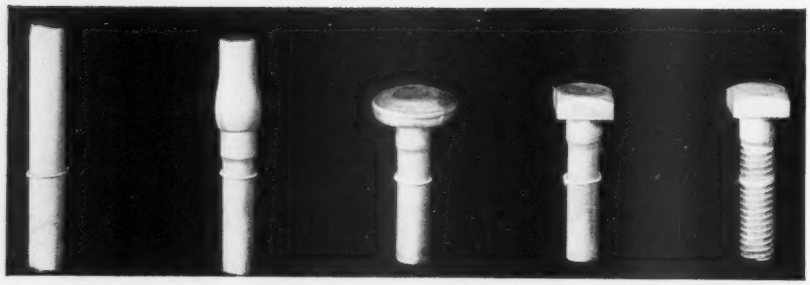


Fig. I. Sequence of operations in single extrusion process.

✦ ✦ ✦ ✦

Fig. II. Sequence of operations in double extrusion process.

✦ ✦ ✦ ✦

IN the double extrusion process, (Fig. II) as used in the National Boltmaker, wire of larger than nominal diameter is used. A suitable length of wire is sheared off and a portion of its length extruded to nominal bolt diameter in the first machine station. This blank is then ejected and transferred to a second die, where a portion of the extruded section is re-extruded to pitch diameter. The head is then upset from the original sized material. In this process heavy reductions in area are encountered. Table II shows these reductions for various sizes of bolts.

✦ ✦ ✦

THE wire used in the above process must possess the following characteristics with respect to coating:—

1st **The coating must be sufficiently thick and strong to prevent metal to metal contact between die and wire when subjected to the reductions shown. However, it must not be too heavy, otherwise sharp shoulders and corners cannot be properly filled.**

2nd **The coating must not be sticky when warm, otherwise it will collect in the die impression and the blanks will be underfilled.**

3rd **The coating must possess sufficient lubricating qualities to permit easy ejection from the die and to keep die wear at a minimum.**

4th **The coating must be uniform throughout the entire shipment. The material is given a 100% test in the heading machine and even a few inches of improperly coated wire may ruin a die and shut down an expensive machine.**

✦ ✦ ✦

WHILE I believe that it is generally accepted that the amount of lime and sull placed on the rod before drawing is the determining factor for an extruding finish, there is a wide variation in finishes even from the same source, and still wider variations from different sources. It seems to me that some test could and should be developed for checking thickness of coating. When such a test has been developed standard coatings could be set up which would be acceptable to both supplier and consumer. This should eliminate such terms as light lime, very light lime, medium lime, etc., which are makeshifts at best.

✦ ✦ ✦

WHILE on the subject of single and double extrusion, I should like to mention the use of sintered carbide dies. These dies have given excellent service in the first station of the double extrusion process and are definitely established. There is some promise that carbide can be used in the second station, which combines an extruding and a heading operation, but much development work must be done before it is generally established.

✦ ✦ ✦

THE second development in the heading field, and probably the most revolutionary, is the "SCRAPLESS NUT" process as developed by the Waterbury Farrel Foundry & Machine Company. In this process a slug is sheared from a coil of drawn wire and in four subsequent operations is formed into a pierced, hexagon nut blank ready to be tapped. (Fig. III).

✦ ✦ ✦

IN order to get machineability in the subsequent tapping operation it has been found necessary to use a low carbon, resulphurized, open hearth steel containing approximately 0.10% sulphur. A typical analysis is shown in Table III. Obtaining uniform, sound steel of this analysis has been and still is a major problem. Certain heats perform beautifully in the heading operation, while others of identical analysis and manufacture are totally unfit due to surface seams and cracks which develop in the upsetting operation. Etch tests and micro studies of these heats usually show them to be of average commercial quality as judged by present standards.

TABLE II

REDUCTIONS USED IN DOUBLE EXTRUSION PROCESS

Size Bolt	Original Wire Diameter	Diameter After 1st Extrusion	Diameter After 2nd Extrusion	Percent Reduction Area
5/16-18	.366	.306	.273	44
3/8-16	.430	.368	.331	45
7/16-14	.492	.430	.388	38
1/2-13	.553	.492	.446	35

WHETHER this trouble goes back to the open hearth or to the finishing practice must be determined. When this has been established, practices must be developed which will produce a satisfactory grade of material. The scrapless nut process is here to stay and its rapid development in many fields depends only upon the ability of the mills to produce better raw materials.

✦ ✦ ✦

THE third problem that is facing the heading industry and its sources of raw material is that of decarburization of the higher carbon materials. The trend in the mass production industries has been and continues to be toward smaller bolts of higher physical properties. In order to obtain these properties, heat treated bolts having a carbon content greater than .30% are regularly employed. Tensile specifications usually lie within the range of 110,000-200,000 lbs. per square inch with hardness values between 200 and 400 Brinell.

✦ ✦ ✦

IN the continuous, non-scaling types of heat treating equipment, the restoring of carbon to the bolt surface becomes impractical. The bolts leave the furnace with the same surface condition that they had upon entering. Therefore, it is essential that decarburization be held to a minimum.

✦ ✦ ✦

TO the best of my knowledge no data are available on the amount of decarburization permissible, so that we can only judge from experience. Past experience indicates that raw material having a carbon free section .005″ deep with a total effected depth of .010″ is near the border line for small, fine thread bolts. For bolts larger than ½″ more tolerance is permissible.

✦ ✦ ✦

UNTIL authoritative data are available, producers of raw materials should make every effort to hold the materials within the above limits. That this can be done is shown by the fact that large tonnages of wire are produced from green and normalized rod with practically no carbon free surface and with an effected depth of less than .006″. I have personally seen many hundreds of tons come in our own plants. On the other hand shipments are occasionally received which have a small percentage of coils that show excessive decar-

(*Please turn to Page 383*)

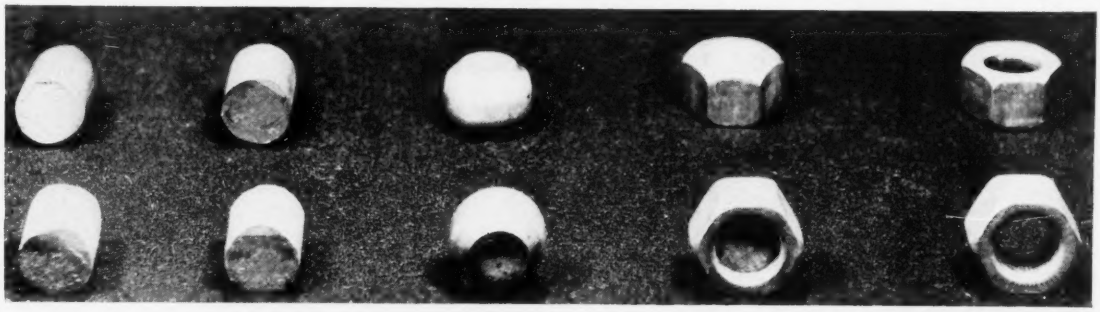


Fig. III. Sequence of operations in scrapless nut process.

✦ ✦ ✦ ✦ ✦ ✦ ✦

ANOTHER line of attack may be in the development of a different analysis. The steel must have the approximate headability of S. A. E. 1010 and be of such structure or composition that the chips will break up readily and clear the tap in the tapping operation. While these properties seem diametrically opposed, some compromise may be reached which will be entirely satisfactory from both standpoints.

✦ ✦ ✦

WHILE on the subject of surface defects I should like to mention "in and out" seams and similar defects. This is the most aggravating type of defect that the headerman has to contend with, either in the heading of bolts or the making of nuts. While the defects may represent but a fractional percentage of the material involved, they are grounds for rejection of the finished product or the raw material.

✦ ✦ ✦

I FORESEE that as time passes the heading industry will be less and less tolerant of this type of defect. Certainly with the knowledge we have of its causes and the methods available for its detection, some cheap means of eliminating it can be devised.

✦ ✦ ✦

THE strength of a bolt is no greater than the strength of the thread engaged by the nut, so that it is absolutely essential that the material in the thread be of the proper analysis and structure in order to develop the above physical properties. When badly decarburized wire is used, this cannot be done without resorting to special carburizing heat treatments on the finished bolt. This is both difficult and expensive and should only be used as a last resort.

✦ ✦ ✦

IN certain batch type heat treating furnaces it is possible to restore carbon to the thread surface by means of a rich, carburizing atmosphere. However, care must be taken that a uniform case of proper depth is obtained throughout the batch.

TABLE III

TYPICAL ANALYSIS FOR "SCRAPLESS NUT" MATERIAL

Carbon	Manganese	Phosphorous	Sulphur
.07	.37	.010	.090
.08	.43	.012	.120

SPRINGS AND WIRE PRODUCTS

Devoted to Products Made Wholly or in Part of Wire, Rod, Strip and Cold Drawn Steel.

J. W. Rockefeller, Jr., Section Editor.

Vol. 12 JULY, 1937 No. 7

New Type of Spring Coilers

Sleeper and Hartley, Inc., Worcester, Mass., announce the development of a new type of spring coiler, together with a new line of torsion spring machines made to accommodate a 4 - slide attachment for cutting and forming ends if desired by the customer. ✦ ✦ ✦

IN 1911 the firm of Sleeper & Hartley, Inc., of Worcester, Mass., started in the manufacture of machinery for wire coiling and wire mills. Since that time, the universal coilers, manufactured by this New England firm have become known in every part of the globe where wire springs are coiled and the world wide recognition they have gained in the past quarter of a century is a sincere tribute to Yankee ingenuity and craftsmanship. Many springs being turned out today are coiled upon some of the earliest equipment built by this firm—equipment which has been in almost continuous service for over two decades.

✦ ✦ ✦

SINCE the first coiler was designed and built by the Sleeper & Hartley Company, much has been learned about the manufacture of springs. New formulas have been evolved for stress determination. New spring materials have come into general use and the ever widening field of spring application has made new demands upon accuracy of the product and flexibility of operation on the part of the machines that turn it out. Simultaneously with changes in the administrative organization of the company, which occurred in 1935-1936, a development programme was undertaken with the aim of making those improvements in their line of equipment which twenty-five years of close contact with spring manufactures had shown to be most desirable.

✦ ✦ ✦

THE problems of the individual spring manufacturer were closely studied. As might be expected, a growing demand for accuracy had been voiced by spring users and echoed by spring manufacturers in their specifications for machinery. Increased speed of operation had emphasized the necessity for more easily made adjustments, since too much time was frequently required to make machine settings.

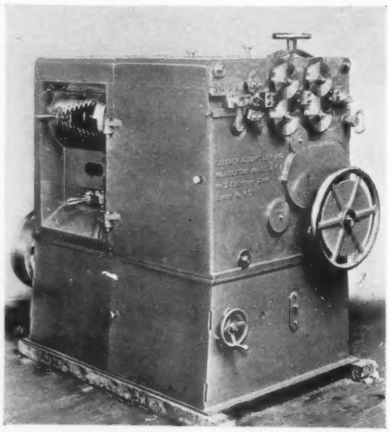


Fig. 1. Universal Coiler (Selective Gear Type) Series 651. ✦ ✦ ✦

✦ ✦ ✦

AS a result of their development programme, the company has recently placed upon the market a new and improved line of equipment, an inspection of which reveals that the most exacting demands of the wire spring manufacturer have been kept pace with.

✦ ✦ ✦

THE new Universal Spring Coilers, a photograph of which appears in the accompanying illustration, is made in a range of four sizes which coil springs of wire from .005 inch to .135 inch in diameter. This model is known as the Selective Type, and one of the outstanding improvements over earlier models is the manner in which changes are made in the length of feed wire, etc. In contrast to the older types which require the removal and replacement of change gears, the Selective Type is equipped with two levers, a slight movement of which is all that is necessary to make the desired changes which are accomplished in the same manner as selective gears on a lathe. The advantage of such an arrangement, particularly in the case of short runs is obvious. The demand for greater accuracy has been met by

the introduction of anti-friction bearings, hardened gears, and shafts and multiple disc clutches and an increase in production capacity over the older type of coiler has also been obtained through novel design features.

✦ ✦ ✦

THE new coilers which are designed to be driven either by a variable speed drive with fully enclosed motor or with single pulley drive may be used as continuous coilers, by a simple adjustment which throws the cut-off out of action.

✦ ✦ ✦

THEIR versatility is even greater than the universal coilers of earlier design and much has been gained in accuracy, durability and ease of operation.

✦ ✦ ✦

New Torsion Spring Machines

IN addition to the New Universal Spring Coilers, the company has also placed upon the market a new line of Torsion Spring Machines. In the design of these machines are incorporated many novel features, which are the result of a close study of the demands of the trade. As in the case of the Universal Coilers, ball bearings or anti-friction bearings are a prominent feature of the new designs, all spindles being mounted in this manner. As a result, there is a decided improvement in the efficiency of the machine, as well as the assurance of longer life, and a more accurately controlled product.

✦ ✦ ✦

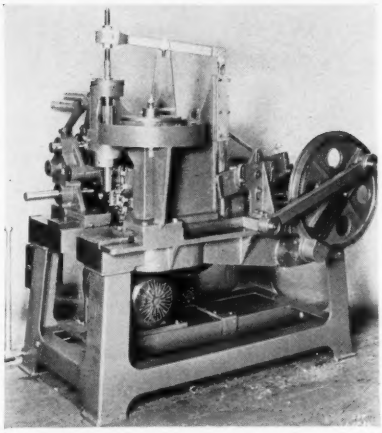


Fig. 2. Improved #2 Torsion, with Universal Forming Slides, Series 626. ✦ ✦

STANDARD equipment, in the case of the torsion spring machines includes a double acting cutting-off slide, which will not only cut-off right or left hand springs, but can also be used to provide bends on the long end of torsion springs, thus eliminating the necessity for an additional operation and offering to the spring maker, the opportunity to manufacture a better product at a lower cost.

✦ ✦ ✦

THESE machines are made to accommodate a four slide attachment for cutting and forming ends, which is available as a separate accessory. The manufacture of certain types of torsion springs, heretofore manufactured in two or more operations on separate machines are thus made from the wire to the finished spring upon a single machine with a consequent saving in time and labor. The machines are so constructed that ample time is allowed for the end forming operation. These machines like the Universal Spring Coilers are equipped for Variable Speed Drive with individual motor or single pulley.

✦ ✦ ✦

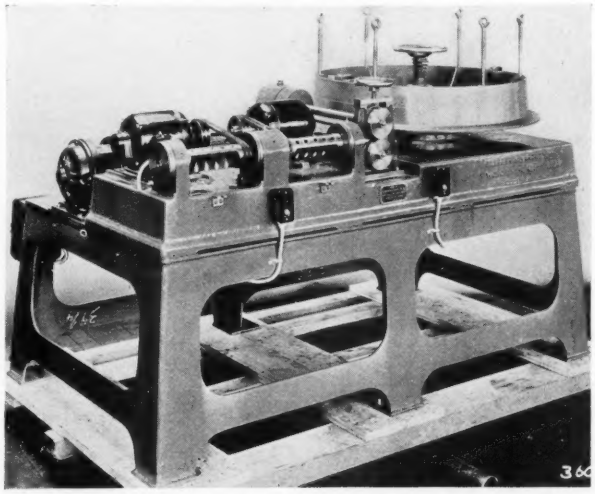


Fig. 3 #2 Straightening and Bundling Machine Series 654 for Wire #17½ (.050) to #10 (.135). ✦ ✦ ✦ ✦ ✦

Wire Straightening Machines

THE wire straightening machines, produced by the company have undergone changes in design and construction that have increased their speed of operation without making any sacrifice in the way of accuracy. Double high speed fliers with blocks for takeup of ample size to overcome the danger of putting a set in the wire after straightening are a novel feature of the new machines. The new wire straightening machines are all motor driven and complete units in themselves.

✦ ✦ ✦

"Standards for Spring Design"—W. W. Griffith, Product Engineering, March, April and May, 1937.—Describes the specifications used by the Atlas Superial Diesel Engine Company. This series of articles is particularly interesting at this time, as there is a decided need for standardization in spring specifications and commercial tolerances.

Peck Spring Catalog

A NEW spring catalog illustrating their products, has recently been issued by the Peck Spring Co., 14 Summit St., Plainville, Conn. The Peck Company manufactures wire springs and screw machine products.

✦ ✦ ✦

Wire, Sheet Metal and Glass

AMONG the divers uses for wire, our attention is being directed to a newcomer, the "baby" of the family. A complement to the operations in light fabricating shops in the last few years, it has grown to be a profitable item in household

(Please turn to Page 364)

Wire, Sheet Metal and Glass

(*Continued from Page 363*)

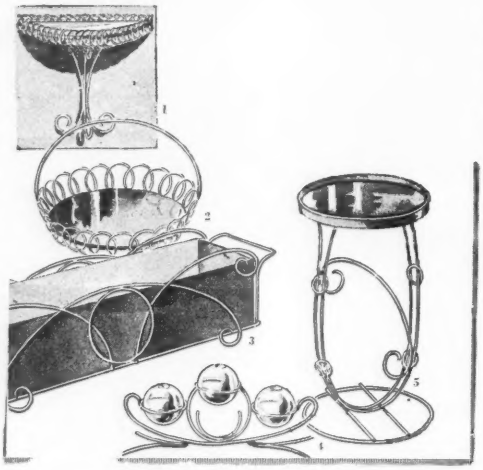
furnishing stores as well as being a boon to interior decorators.

✦ ✦ ✦

WIRE, sheet metal and glass. This trio, when fabricated into brackets for plants, baskets for fruit, sandwich trays, window boxes, center pieces, pedestals, mirror frames, etc., has had the most amazing effect on "stuffy looking" rooms. These items, fitting as they do into any decorating scheme, impart a refreshing coolness due to their varied shapes and available contrasting colors.

✦ ✦ ✦

LET us see what this means to the wire fabricator. No doubt in the coiling of the wire for each piece from ten to sixty feet of wire might be used. With sales volume running into the hundred thousands and increasing daily, it can readily be seen that here is an item worthy of consideration by the fabricators, as well as producers of wire.



THE construction seems to be simple flat or overlaid coils spotwelded to other special shapes for handles, legs, bases or other decorative gadgets. Various colored enamels are either sprayed or dipped after assembly.

✦ ✦ ✦

FROM the foregoing, it can be seen that the production of this item is well within the scope of the average up to date wire fabricating shop.

✦ ✦ ✦

Wood Screw Import Duties Reduced in the United Kingdom

EFFECTIVE April 27, 1937, the UNITED KINGDOM import duty on screws for wood (other than coach screws, screw hooks, screw rings and screw knobs) of iron and steel, whether coated or plated or not, was reduced to 20 percent ad valorem.

Charged Agricultural Fences

By J. DELMONTE

DURING the past year there have appeared in the mid-west a number of low cost wire fences, among farmers and ranchers who have been reluctant to mark the boundaries of their lands in the past. As this represents an outlet for wire products, it may be of interest to the reader to note a few of the details.

✦ ✦ ✦

WIRE fences for farm lands have, in the past, been of very sturdy construction, designed to withstand the elements the year around and the normal wear concomitant with large herds of cattle. Over the rough terrain of the land, the expense of altering the course of the fences to meet sudden gulleys and mounds, plus the comparatively high cost of the wire mesh construction have been prohibitive in many cases. Small areas on flat territory are bounded with these wire mesh fences. However, on the side spaces of the farm and cattle lands, it is feasible to look for a fence of simpler and less expensive construction.

✦ ✦ ✦

AN answer to the problem lies in the electrically charged fence, which consists of a few wires marking the outline of a territory for many miles. It is reported in agricultural journals that over 5000 of these fences have been sold to farmers since 1932, chiefly in the state of Wisconsin. Contrary to the earlier fears of the consumers, the electrically charged fences have not administered very severe shocks to those coming in contact with the wires, and no fatalities or injuries to livestock are reported. Of course, the potency of the electric charge is a function of the voltage applied to the wires. By selecting a proper voltage, the effects of the charge have been far from serious, and totally effective in keeping livestock within boundaries over large areas.

FOR some time, barbed wire fences have been used to keep cattle within certain areas. However, these fences are objectionable in a number of instances, in that the barbs tear the skin of the livestock and that the barbed wire is more expensive than the straight wire of the electrically charged fences.

✦ ✦ ✦

OF course, there is an operating cost attached to electrically charged fences, but by careful planning this cost may be kept very low. In assuming that several wires, forming the fence, are maintained at the same potential with respect to the ground, there will be no power cost, unless: 1) Livestock come in contact with the wires and the momentary surge of energy causes a drain on the power supply, contingent upon the proximity of the source of power; 2) Wires fall from their supporting posts and the energy drains into the return ground circuit; and 3)

(*Please turn to Page 375*)

Exports and Imports of Wire

Exports of Iron and Steel Wire Products in April, 1937 and April, 1936
(In Gross Tons)

	APR. 1937	MAR. 1937	APR. 1936
Wire rods	6,508	3,057	4,664
Strip steel	18,677	8,568	5,289
Plain, black or galvanized iron or steel wire	4,041	6,179	3,288
Barbed wire and woven wire fencing	3,400	3,785	3,204
Woven wire screen cloth	185	119	100
Wire rope	480	648	.....
Insulated iron or steel wire and cables—see analysis below			
Other wire and manufactures	845	702	367
Wire nails	2,096	2,653	850
Tacks	21	26	24
Other nails, including staples	204	411	288
Bolts, machine screws, nuts, rivets and washers	1,005	1,002	561
Total, these 11 classifications	37,462	27,150	18,635

Imports of Iron and Steel Wire Into the United States
(In Gross Tons)

Concrete reinforcement bars	586	1,183	202
Hollow bars and drill steel	254	255	185
Wire rods	1,751	1,631	1,597
Barbed wire	1,746	1,297	1,439
Round iron and steel wire	581	595	233
Telephone and telegraph wire	.....	2	5
Flat wire and strip steel	300	332	259
Wire rope and strand	396	334	257
Other wire	252	410	138
Hoops and bands	3,426	2,586	2,681
Nails, tacks and staples	2,686	1,991	2,337
Bolts, nuts and rivets	23	92	36
Total, these 12 classifications	12,001	10,708	9,369

Exports of Insulated Wire and Cable, April, 1937

	Foreign		To U. S. Possessions	
	Pounds	Dollars	Pounds	Dollars
Insulated iron or steel wire and cable	68,463	$ 10,290	1,253	$ 384
Rubber-covered wire	767,957	223,445	120,329	27,433
Copper weatherproof wire	232,162	46,524	47,949	9,431
Copper telephone cable	79,342	11,300	173	27
Other insulated copper wire	474,193	150,527	116,950	19,058
Nickel-chrome electric resistance wire	79,909	76,065	.....	.....
Total, these 6 classifications	1,702,026	$518,151	286,654	$56,333

Pig Iron Exports Sharply Upward in April

HIGHER trade prevailed in 36 items of export (comparing April with March) with offsetting losses being recorded in 32. The outstanding increase (23,742 tons) was registered in pig iron shipments, others of moment being in black steel sheets (10,959 tons), hot-rolled strip steel (10,454 tons), tin plate (7,805 tons), skelp (5,217 tons), and fabricated plate (3,786 tons). The principal decline recorded (11,626 tons) was in heavy rail shipments, followed by those in plain structural shapes (3,990 tons), seamless casing and oil-line pipe (2,759 tons), unlined tanks (2,238 tons), and fabricated shapes (1,871 tons).

Pig Iron, Tin Plate, Black Steel Sheets, and Unfabricated Plate Lead in April

FROM a tonnage standpoint, pig iron was the leader in the April export trade, its total (38,177 tons) going mostly to Japan (27,723), Sweden (5,444), Czechoslovakia (1,193), the Union of South Africa (1,000), and Germany (1,000). Then came tin plate (30,289 tons) in a wide range of trade, the outstanding markets being Canada (6,722), Japan (3,987), China (3,632), Brazil (1,518), and Kwantung (1,479). Following were black steel sheets (29,327 tons) which also found numerous outlets, the chief ones being Soviet Russia (7,605), Canada (6,951), Netherlands Indies (2,399), France (2,148), and Japan (2,137). Next was unfabricated plate (26,889 tons) going chiefly to Japan (4,582), Sweden (3,891), Canada (3,851), China (2,698), Netherlands Indies (1,289), and the Union of South Africa (1,239). Fifth was hot-rolled strip steel (16,270 tons), with Canada (13,909), the United Kingdom (724), and British India (704) the outstanding purchasers. Plain shapes (12,179 tons) ranked sixth, the bulk of shipments going to Canada (5,812), China (2,389) Sweden (1,011), and Chile (544).

✦ ✦ ✦

Far East Remains Leading Outlet

FOR the second successive month, the Far East in April led in the purchase of semi-finished and finished iron and steel products from the United States. Its total of 94,792 tons accounted for 37.1 percent of all shipments made (against a trade accounting for 32.7 percent of March shipments). Not far behind came the trade with North and Central America and the West Indies which involved 92,018 tons, 36 percent of all shipments (35.7 percent). Then was Europe (37,924 tons) accounting for 14.8 percent (9.5 percent), followed by South America's total of 22,772 tons (8.9 percent and 14.8 percent). Africa ranked last in a trade aggregating 8,282 tons (3.2 percent and 2.8 percent).

✦ ✦ ✦

Canada Again Chief Individual Market

CANADA retained in April its leading position as an outlet for American semi-finished and finished iron and steel products, its total of 61,362 tons including chiefly hot-rolled strip steel (13,909), skelp (11,124), black steel sheets (6,951) tin plate (6,722), and plain shapes (5,812). Next was Japan (55,495 tons) whose trade was mostly pig iron (27,723), wire rods (4,762), unfabricated plate (4,582), tin plate (3,987), ingots (3,839), fabricated plate (3,454), and black steel sheets (2,142). China—the third market—took 13,775 tons made up chiefly of tin plate (3,622), unfabricated plate (2,950), plain shapes (2,389), black steel sheets (1,936), and 'other' steel bars (1,054). Following came Sweden (12,233 tons) whose trade was mostly pig iron (5,444), unfabricated plate

Exports and Imports

(*Continued from Page 365*)

(3,891), plain shapes (1,011), and tin plate (508). The next market —Soviet Russia—took chiefly black steel sheets (7,605 tons) out of a trade totaling 8,136 tons. The sixth market was the Philippine Islands (7,621 tons) which took principally galvanized steel sheets (2,245), tin plate (915), unfabricated plate (608), 'other' steel bars (513), light rails (405), and wire nails (393).

✦ ✦ ✦

Imports Continue Upward

IMPORTS of iron and steel products (excluding scrap) during April amounted to 56,484 tons valued at $2,709,526 against 49,898 tons valued at $2,420,133 in March, and 40,828 tons valued at $1,700,619 in April 1936. Compared with the March totals, higher receipts were noted in 17 classifications, lower in 18, in 3 no trade occurred during either month, and in 1 product the trade remained constant. The outstanding increase (2,337 tons) was that in 'other' pipe receipts, followed by those in shapes (2,066 tons), solid and hollow bars (1,478 tons), 'other' hoops and bands (840 tons), pig iron (749 tons), and nails, tacks, and staples (695 tons). The chief decline (1,480 tons) was in receipts of spiegeleisen, others of moment occurring in those of ferromanganese (729 tons), and concrete reinforcing bars (577 tons).

✦ ✦ ✦

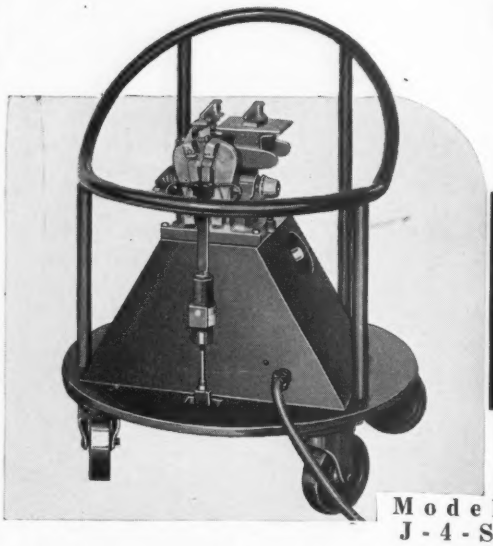
Pig Iron Still Tops Import List

PIG iron receipts—from a tonnage standpoint — at 11,464 tons headed the list of iron and steel imports (excluding scrap) and came mostly from British India (7,791), and the Netherlands (2,960). Following were shapes (10,716 tons) mostly from Belgium (8,118), and France (2,280). Third were solid and hollow bars 6,891 tons) taken chiefly from Belgium (4,762), France (1,208), and Sweden (540). Then was 'other' pipe (4,357 tons), the chief suppliers being Germany (3,619), Sweden (287), and Poland (200). 'Other' hoops and bands ranked next with a total of 3,426 received chiefly from Belgium (2,080), Germany (655), and France (627). Ferromanganese (3,379 tons) was sixth in importance, the bulk coming from Norway (2,835), and Canada (279).

✦ ✦ ✦

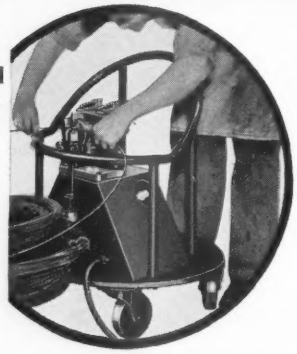
Belgium Remains Leading Country of Supply

BELGIUM remained in April the leading supplier of iron and steel products (excluding scrap) to the United States, its total of 19,522 tons consisting of chiefly shapes (8,118), solid and hollow bars (4,762), 'other' hoops and bands (2,080), and sheets, skelp, and sawplate (1,385). Following was Germany (10,118 tons) sending in mostly 'other' pipe (3,619), nails, tacks, and staples (1,658), barbed wire (1,302), and welded pipe (1,156). British India (7,791 tons) confined its trade solely to pig iron, and the next country of importance—France—had a trade aggregating 4,600 tons of chiefly shapes (2,289), solid and hollow



Wins instant approval!

Low Type MICRO-WELD MODEL (Only 31" high)



Model J-4-S

The wide-spread demand for a portable, low-type welder is successfully met by this new MICRO Model J-4-S.

Height to welding dies—23".

Round steel base—no corners or edges to catch wires.

Frame—heavy rolled steel plates, arc welded.

Welding headpieces—hard bronze.

Full swivel casters—easy to move in any direction.

Guard rail—protects working parts.

Annealing dies for use on hard rolled and high carbon material—regular equipment.

Welding capacity —8 to 18 gauge.

Quickly proves its convenience and efficiency wherever in use.

Works close to reel for galvanizing and other applications.

Micro Model J-4-S solves many perplexing welding problems.

Micrometer Precision MICRO-WELD

Trade Mark Reg. U.S. Pat. Off.

Write for complete details.

MICRO PRODUCTS COMPANY

20 NORTH WACKER DRIVE, CHICAGO, ILLINOIS

Telephone State 7468

General Office and Factory, Peoria, Illinois

bars (1,208), and 'other' hoops and bands (627). Fifth was Sweden (4,081 tons), in a trade of mostly wire rods (1,373), solid and hollow bars (540), round iron and steel wire (417), and iron bars (410). Sixth was Norway (3,392) which confined its trade mostly to ferromanganese (2,835), and spiegeleisen (450).

✦ ✦ ✦

IMPORTS of CARD CLOTHING totaled 34,922 square feet valued at $40,734 (30,982 square feet valued at $48,257 in March) and came from the United Kingdom (30,807 square feet and $33,602), Switzerland (2,077 square feet and $3,394), and Germany (2,038 square feet and $3,738).

✦ ✦ ✦

WIRE HEDDLE receipts totaled 656,000 pieces in comparison with 1,395,000 pieces in March and were imported from Germany (442,000 pieces), France (113,000 pieces), and Switzerland (101,000 pieces).

✦ ✦ ✦

THE trade in WIRE CLOTH AND SCREENING at 144,332 square feet compared with 79,446 square feet in March and came in from Germany (109,225), Canada (13,000), the Netherlands (12,954), and France (9,153).

✦ ✦ ✦

WIRE FENCING AND NETTING of the galvanized before weaving grade was imported to an aggregate of 980,825 square feet (1,431,125 square feet in March) and was supplied by Belgium (587,575), and Germany (393,250). Of the galvanized after weaving grade the total was 4,638,350 square feet (1,113,750 square feet) with Belgium (2,644,050), the Netherlands (1,018,250), and Germany (976,050) the suppliers.

✦ ✦ ✦

FOURDRINIER AND OTHER PAPER-MAKING WIRE imports at 51,912 square feet compared with 44,330 square feet in March and came from Austria (19,760), Germany (13,286), Sweden (9,550), and France (9,316).

✦ ✦ ✦

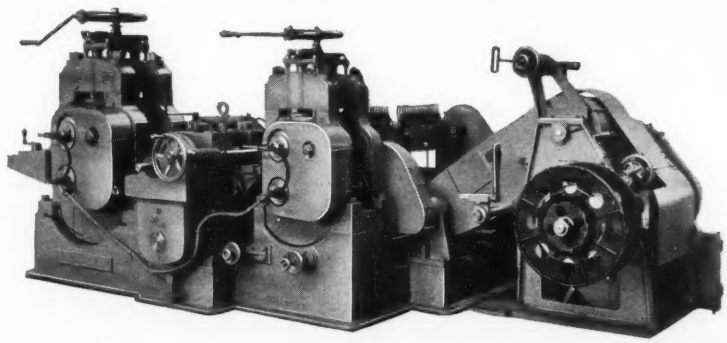
EXPORTS of iron and steel wood screws during April, 1937, totaled 22,495 gross valued at $3,402. Of this total Cuba took 6,213 gross valued at $770; Philippine Islands, 5,930 gross valued at $574; Costa Rica 2,251 gross valued at $241; Canada 1,376 gross valued at $469; Chile, 1,345 gross valued at $229; Colombia 1,223 gross valued at $203.

✦ ✦ ✦

EXPORTS of brass wood screws during the same month totaled 9,449 gross valued at $3,420. Of this total Philippine Islands took 2,590 gross valued at $636; Cuba 2,132 gross valued at $725; United Kingdom 719 gross valued at $388; Bermuda 664 gross valued at $173; Chile 544 gross valued at $130.

✦ ✦ ✦

IMPORTS of wood screws during the same month totaled 61,406 gross valued at $3,085. Of this total Japan supplied 50,036 gross valued at $2,327; Belgium 10,200 gross valued at $575; Germany 750 gross valued at $42 and Czechoslovakia 420 gross valued at $141.



Precision Tandem Rolling and Edging Mill With Universal Traverse Winder And Torrington Mechanical Lubricators

THE EQUIPMENT ILLUSTRATED IS USED FOR THE ACCURATE ROLLING AND EDGING OF FLAT COPPER WIRE WITH SPECIAL EDGE RADII.

A COMPLETE RANGE OF PRECISION TANDEM MILLS FULLY EQUIPPED WITH ANTI-FRICTION BEARINGS AVAILABLE.

WE ARE SPECIALISTS IN THE DESIGN AND BUILDING OF ROLLING MILL, TUBE, AND WIRE MILL AUXILIARY MACHINERY.

TORRINGTON MECHANICAL LUBRICATORS PROVIDE CONTINUOUS POSITIVE LUBRICATION STARTING AND STOPPING WITH THE MACHINE.

THE TORRINGTON MFG. CO.
TORRINGTON, CONN. U. S. A.

A Review of Recent Wire Patents

No. 2,077,497, SPRING, Patented April 20, 1937 by Robert L. Stevens, Detroit, Michigan.

A securing element is provided for helical springs, comprising a body having an enlarged head provided with a bearing surface and having a slot through which each of the coils extend, and bent portions on this body retaining the convolutions in the slot.

✦ ✦ ✦

No. 2,077,682, DRAWING PROCESS, Patented April 20, 1937 by Samuel James Everett, London, England, assigner to Thos. Firth & John Brown Limited, Yorkshire, England, a British company.

This process is for the production of fine wires, strips, thin sheets or the like by reduction from elements of larger cross-section and comprises assembling inside a tubular casing a number of metal elements composed of alloy steel comprising 0.5% to 0.20% carbon, 6% to 14% nickel and 10% to 20% chromium, and then subjecting the encased elements as a unit, to reducing operations to reduce the cross-section area of all the elements, simultaneously, after which the casing is removed.

✦ ✦ ✦

No. 2,077,784, PROCESS OF MANUFACTURING NAILS, Patented April 20, 1937 by Elbert D. Tripp, Chicago, Ill.,

Complete Descriptions and Drawings of Patents May Be Had for 25 cents. Address, Wire & Wire Products, 17 East 42nd St., New York.

assignor to Albert J. Deniston, Jr., Chicago, Ill.

More specifically, the process covers forming the lead head of wire nails.

✦ ✦ ✦

No. 2,078,226, WIRE FABRIC MAKING MACHINE, Patented April 27, 1937 by Arthur Ernest Blashill, Withington, Manchester, England.

This machine is adapted for the manufacture of wire fabric having square or rectangular mesh.

✦ ✦ ✦

No. 2,078,369, METHOD AND APPARATUS FOR JOINING WIRE CLOTH, Patented April 27, 1937 by William E. Buchanan, Appleton, Wis., assignor to Appleton Wire Works, Inc., Appleton, Wis., a corporation of Wisconsin.

Wre cloth, such as is employed in paper making machines, is specifically mentioned as a product of this method and apparatus, the inventor obviating the use of laced seams in the wire cloth.

✦ ✦ ✦

No. 2,078,630, MACHINE FOR MAKING COILS OF WIRE, Patented April 27, 1937 by Charles Eisler, South Orange, N. J.

Filaments for radio tubes and the like are manufactured on this machine, and an object is to coil the filament so that there is a uniformity of pitch and an evenness in looping.

✦ ✦ ✦

No. 2,078,828, SPRING MACHINERY, Patented April 27, 1937 by Charles H. Baer and Herschel M. Connor, San Francisco, Calif., assignors to Connor Spring Manufacturing Co., San Francisco, Calif., a copartnership composed of Charles H. Baer and Herschel M. Connor.

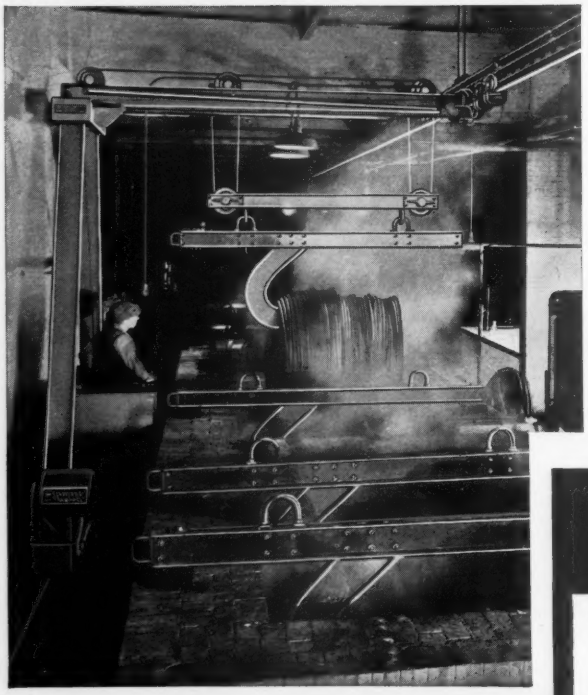
A looping machine is disclosed including a blade adapted to impale a spring and support it in position for looping, loop bending means cooperating with this blade.

✦ ✦ ✦

No. 2,078,940, SCREEN CLOTH, Patented May 4, 1937 by John J. Grebe, Midland, Mich., assignor to Ewing Development Company, Bay City, Mich., a corporation of Michigan.

This cloth is adapted for window and door screens and the like and, in addition to the exclusion of insects, the cloth is adapted for excluding the direct rays of the sun.

OVERHEAD MATERIALS HANDLING EQUIPMENT



• Thirteen Mills have changed to straight line cleaning and have installed Cleveland Tramrail Cleaning House Cranes. Three have been installed so far this year — more on our drawing boards for final estimates.

• Many other Cleveland Tramrail cleaning and handling ideas are in money saving operation in all branches of the Wire and Wire Products industry.

Consult your phone directory under Cleveland Tramrail.

CLEVELAND TRAMRAIL

DIVISION OF

THE CLEVELAND CRANE & ENGINEERING CO.

1141 Depot St.

WICKLIFFE, OHIO

A Review of Recent Wire Patents

No. 2,079,873, WIRE ROPE MANUFACTURE, Patented May 11, 1937 by Malcolm W. Reed, Cleveland, Ohio.

The invention is embodied in a stranding machine including a revoluble frame with a die mounted by the frame with its center line offset from the axis of the frame, and a number of roller-sets mounted by the frame behind the die. A stationary gear is mounted adjacent the frame and there is provided means for intergearing the roller-sets which includes a gearing element engaging the stationary gear.

✦ ✦ ✦

No. 2,079,874, ROPE STRUCTURE, Patented May 11, 1937 by Malcolm W. Reed, Shaker Heights, Ohio, and Eugene J. Reardon, Worcester, Mass.

Each of the rope elements comprises a number of strands, some of the strands being common to all of the elements and extending therebetween to bind the elements together. The common strands complementing the strand structure of each of the elements and constitutes a substantial portion thereof.

✦ ✦ ✦

No. 2,079,907, NEEDLE WIRE, Patented May 11, 1937 by Leslie D. Hawkridge, Newton Center, Mass., assignor to Crucible Steel Company of America, New York, N. Y., a corporation of N. J.

Wire stock is provided for swaging into needles, the wire being formed of steel containing from about 0.6 to 1.3 per cent of carbon, sulfur from about 0.025 per cent to 0.5 per cent and the remainder of the steel being substantially iron.

✦ ✦ ✦

No. 2,079,943, INSULATED ELECTRICAL CONDUCTOR, Patented May 11, 1937 by George Spencer Lobdell, Rome, N. Y., assignor to General Cable Corporation, New York, N. Y., a corporation of N. J.

About the wire conductors is a sheath of rubber with a relatively thinner outer sheath of substantially non-porous olefin polysulfide reaction product which has been heat treated in the presence of a gas formation retarding substance selected from the classes of aromatic amines, napthol and phenols containing respectively the group NH_2 and the group OH combined with radicals which so limit the activity of the groups as to cause the reduction of gas formation in the product under curing conditions.

✦ ✦ ✦

No. 2,080,068, NOISELESS AND ANTISLIPPING PAD FOR BEDSPRINGS, Patented May 11, 1937 by Ralph Weisman, Detroit, Michigan.

This pad is adapted for employment with wire bed spring structures provided with an extension hook secured to and extending outwardly from the horizontal side of the frame structure.

No. 2,080,110, BRIDGE WIRE, Patented May 11, 1937 by Bert Brenner, Union, N. J., assignor to Sigmund Cohn, New York, N. Y.

This bridge wire comprises an alloy of rhodium, ruthenium and platinum in the proportions of 2% to 25% of the first, 2% to 15% of the second and the balance platinum.

✦ ✦ ✦

No. 2,080,518, METHOD OF AND APPARATUS FOR COATING STRANDS, Patented May 18, 1937 by Carl M. Underwood, Oak Park, Ill., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

The method comprises moving the wire strand through a bath of molten coating metal and passing a stream of superheated steam longitudinally of the strand to remove the excess coating metal, the temperature of the superheated steam when it first strikes the strand being higher than the melting point of the coating metal.

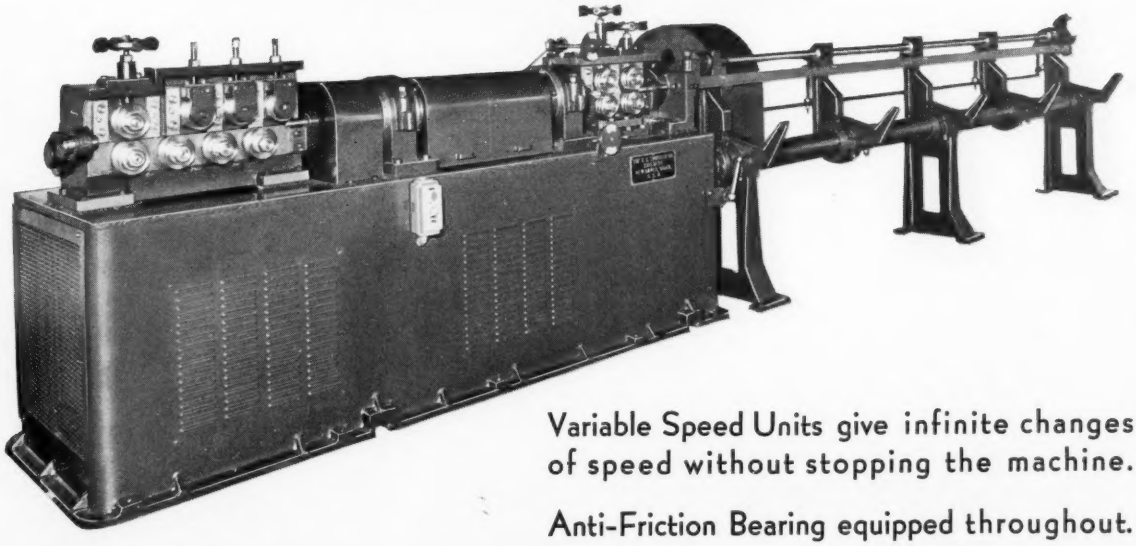
✦ ✦ ✦

No. 2,080,599, WIRE DRAWING METHOD AND LUBRICANT THEREFOR, Patented May 18, 1937 by Silas A. Braley, Pittsburgh, Pa., assignor to Pittsburgh Steel Company, Pittsburgh, Pa., a corporation of Pa.

(*Please turn to Page 370*)

SHUSTER DUAL CONTROL AUTOMATIC WIRE STRAIGHTENING AND CUTTING MACHINE

Contains many new features.



Variable Speed Units give infinite changes of speed without stopping the machine.

Anti-Friction Bearing equipped throughout.

THE F. B. SHUSTER COMPANY New Haven, Conn.

Straightener Specialists Since 1866

A Review of Recent Wire Patents

(Continued from Page 369)

The wire stock is coated with lime and then drawn through a suitable die, with a lubricant comprising aluminum palmitate.

✦ ✦ ✦

No. 2,081,167, GARMENT HANGER MAKING MACHINE, Patented May 25, 1937 by Louis Brownstein, Brooklyn, N. Y., assignor to Standard Hanger Co., Inc., Brooklyn, N. Y., a corporation of New York.

A cutter operates on two rolls of wire, cutting off a length while the twister is operating upon the length of wire previously cut.

No. 2,081,384, INSULATED ELECTRICAL CONDUCTOR, Patented May 25, 1937 by Rudolph A. Schatzel, Rome, N. Y., assignor to General Cable Corporation, New York, N. Y., a corporation of N. J.

More specifically, the insulation is one provided for high heat resistance in connection with electrical conductors.

✦ ✦ ✦

No. 2,081,420, ELECTRICAL CONDUCTOR, Patented May 25, 1937 by Edgar D. Bent, Montreal, Quebec, and William H. Eastlake, Mount Royal, Quebes, Canada, assignors to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

This conductor is adapted particularly for power lines to household apparatus such as electric grills and the like, the conductor being provided with a cover of wool fibres treated with glycerol and impregnated with a moisture proof material and a layer of fireproofing material over the impregnated wool cover.

✦ ✦ ✦

No. 2,081,427, ELECTRIC COMMUNICATION CABLE, Patented May 25, 1937 by Neal V. Firth, Roselle, and Arthur G. Hall, Cranford, N. J., assignors to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York.

The aim of this invention is to insure low cross-talk effect in communication cable.

✦ ✦ ✦

No. 2,081,517, CONDUCTING RUBBER AND ITS APPLICATION, Patented May 25, 1937 by Hendrik Adriaan Marius van Hoffen, Amsterdam, Netherlands, assignor to Naamlooze Vennootschap Hollandsche Draad-en Kabelfabriek, Amsterdam, Netherlands, a corporation of the Netherlands.

The rubber coating is provided with finely divided carbon dispersed therethrough.

✦ ✦ ✦

No. 2,081,630, METHOD OF MAKING LIQUOR FINISHED WIRE, Patented May 25, 1937 by William E. Leonard, Worcester, Mass., assignor to The American Steel and Wire Company of New Jersey, a corporation of N. J.

In order to provide a clean surface to the wire, this inventor subjects the drawn wire to the action of a metallic salt solution of such character as to produce a coating of the color desired and subsequently burnishing without any reduction of the gage of the wire.

✦ ✦ ✦

No. 2,081,634, ELECTRIC CORD OR CABLE, Patented May 25, 1937 by Owen A. McNamee, Worcester, Mass., assignor to The American Steel and Wire Company of New Jersey, a corporation of N. J.

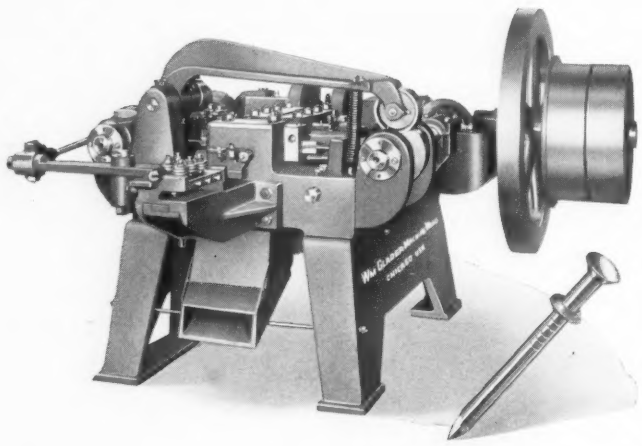
A flat-cord multiple strand electric cable is provided by this inventor.

✦ ✦ ✦

No. 2,081,691, CABLE MANUFACTURE, Patented May 25, 1937 by George Zapf, Cologne, Germany, assignor to Felten & Guilleaume Carlswerk Actien-Gesellschaft, Cologne-Mulheim, Germany.

In order to provide a moisture protection for a wire cable, this inventor provides flat metal bands of uniform thickness which are drawn from reels of a twisting machine, given longitudinal acute angled poles and laid over the cable, the vertex of the fold of each band lying in a recess of the next band, and the various bands forming a covering concentric with the cable core. During the laying of the folded bands, the joints between the separate bands are filled with a sealing material.

GLADER WIRE NAIL MACHINERY



We Have Recently Made An Addition To Our Line Of Wire Nail Making Machinery.

The Machine Illustrated Above Produces The "Duplex" or Twin-Head Wire Nails.

For Further Information Address

WM. GLADER MACHINE WORKS

210 N. Racine Avenue,

CHICAGO, ILLINOIS

'Round the World With the Wire Industry

Equipment for New Indian Steel Mill

RECENTLY formed by the amalgamation of the **Indian** Iron and Steel Company and the Bengal Iron Company, the first named is said to be contemplating the flotation of a share issue of approximately three to four million pounds in London and India within the near future. The money thus received is said to be for the purpose of purchasing equipment for the proposed new 200,000-ton per annum steel plant which is to be erected in conjunction with the Indian Iron and Steel Company's existing plant at Hirapur. Our Calcutta Office advises that unofficial statements indicate that deliveries will play a very important part, and that it is thought that American firms in a position to quote good deliveries may stand some chance of securing at least part of this plant order.

German Notes

NO important price changes occurred during the past months except for wire netting which increased from 5 to 7%. There is a great scarcity of this material abroad and supplies in Germany are also falling short of the demand, in spite of the heavy increase in production. The Far Eastern markets are particularly "starving" for wire netting and are prepared to pay any price.

✦ ✦ ✦

German Wire Industry

THE German wire industry continues to prosper, operating at capacity rate, handicapped only by shortage of wire rods. Although wire rod production is at record figures (above 112,000 tons monthly) and exports are curtailed, the very heavy influx of export orders for wire and the domestic demand, made it necessary to curtail supplies to domestic manufacturers to 25% above last year's supplies and to export manufacturers to 45% above last year. The industry, could, however, absorb far more.

✦ ✦ ✦

THE only product in which competition has increased somewhat is wire nails. This is because many countries, which formerly were not competing or only slightly, such as Poland, Hungary and Yugoslavia, are quickly expanding their export trade. Poland increased exports from 1,100 tons wire nails in 1934 to 1,847 tons in 1935, and to 6,200 tons in 1936. Yugoslavia from 550 tons to 2,260 tons, and Hungary from 1,380 to 3,750 tons. These countries are further expanding their export trade. On the other side, the "hunger" for all wire products in Japan is such that competition from that country cannot be re-

(*Please turn to Page 372*)

Announcing Over 10,000 Kw Installed!

Electric Lavite Furnaces are now operated by 200 typical progressive concerns:

FOR ANNEALING*
Rods and Fine Wire
Rivets and Stampings
Sheets and Tubing

FOR ALUMINUM HEAT TREATING*
At All Air Bases
Aeroplane Sheets
Rivets and Stampings

FOR HARDENING*
Hardware Products
Stainless and High Speed Steels
Gears and Automotive Parts

FOR PRECIOUS METAL HEATING*
Watch Cases and Optical Goods
Silver Bars and Plate
Gold Stampings

*(Names of users of typical Lavite Furnace Processes on request).

It is gratifying to have had a pioneer role with these organizations in creating new metal heating practices. We will gladly tell you how they may be applied to the heating of your metal products.

The Bellis Heat Treating Company
Branford, Connecticut
or
Lavite Limited, Low Moor
Yorks, England

'Round the World With the Wire Industry

(*Continued from Page 371*)

sumed. Because European wire rod suppliers are holding back, it will take many months before supplies will be normal there. In the meantime many customers not able to get their ordered wire products from Japan have cancelled the orders and are trying to place in Europe, these orders which exceed 14,000 tons. As the British Empire markets, bound under the Anglo-Continental agreement to buy in England, but unable to get supplies there, are combing the Continental producers, the placement of these 14,000 tons is next to impossible.

WIRE ASSOCIATION

Welcome To

THE

AMBASSADOR

OCTOBER 18th TO 23rd

When you come to Atlantic City, make your headquarters at the largest hotel nearest the auditorium . . . The Ambassador. You'll be adding hours of pleasure and enjoyment to your stay by being so close to everything that's going on. And The Ambassador is Atlantic City's finest hotel, located directly on the boardwalk with most guest rooms facing the Atlantic. You'll find everything you want at The Ambassador . . . comfortable rooms at moderate rates . . . fine restaurants . . . indoor swimming pool and other recreational facilities . . . spacious sun decks and public rooms. May we make a reservation for you now?

THE AMBASSADOR, ATLANTIC CITY

WILLIAM HAMILTON
Managing Director

HAROLD E. BAGGS
Convention Manager

THE demand for ship nails (cut steel nails), horse shoe nails and cut sheet tacks (blue annealed) is very heavy. Shipping dates exceed 20 weeks. The price paid for 6″ ship nails is £ 16; for assorted blue annealed tacks up to 1″, £ 20 to 21; and for horse shoe nails, American or countersunk, light quality £ 17.10 (paper, f.o.b).

✦ ✦ ✦

German Wood Screw Cartel

THE German wood screw cartel now includes the 14 manufacturers of wood screws in Germany. This concerns the export trade also as the export office of the cartel regulates the whole trade.

✦ ✦ ✦

CONTINENTAL exporters have placed a few hundred ton orders for nails in Canada for export to the Near East but failed to buy heavier quantities due to the reluctance of Canadian makers to release more quantities for export.

✦ ✦ ✦

THE only wire product, for which no price rise is due, is needles. This is due to continuation of a keen competition on the market. The German export figures for the first four months were up in quantity by 3.1% but less 1.7% in value.

✦ ✦ ✦

Phelps Dodge Copper to Double Capacity of Its Habirshaw Works

WYLIE Brown, president of Phelps Dodge Copper Products Corporation, announced the placing of a contract for the erection at Yonkers, N. Y., of an addition to the plant of the Habirshaw Cable & Wire Division. The new plant will make all types of insulated power cables used by public utilities and industrial companies. It will more than double the Habirshaw facilities.

✦ ✦ ✦

THIS new plant will be equipped with the most modern type of machinery, testing laboratories and research laboratories.

Shuster No. 4A Dual Control Automatic Wire Straightening and Cutting Machine

THE new Shuster Machine is a modern automatic wire straightening and cutting machine, which feeds the wire from the coil, straightens it, and cuts it to accurate lengths. Through the use of two Ball Bearing, fully enclosed, Variable Speed Units, High Speed Cut Off Cam, and Quick Acting Clutch, the possibility of marking or swelling the wire is practically eliminated, without the use of intricate mechanism or moving parts. The machine is anti-friction equipped throughout.

✦ ✦ ✦

INFINITE changes of speed for the feed and cut off are possible through the use of the Variable Speed Units, eliminating the necessity of stopping the machine for changing the speeds. The operating handles are conveniently placed on the front of the machine. One handle operates the feed and rough roll straightening units, and the other operates the cut off.

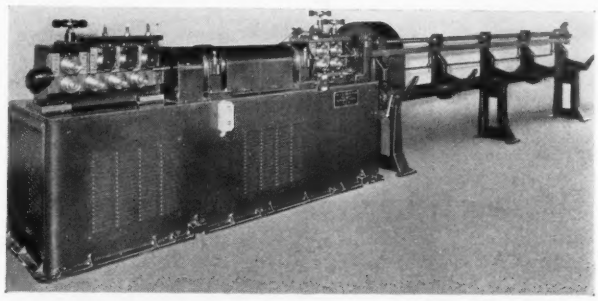
✦ ✦ ✦

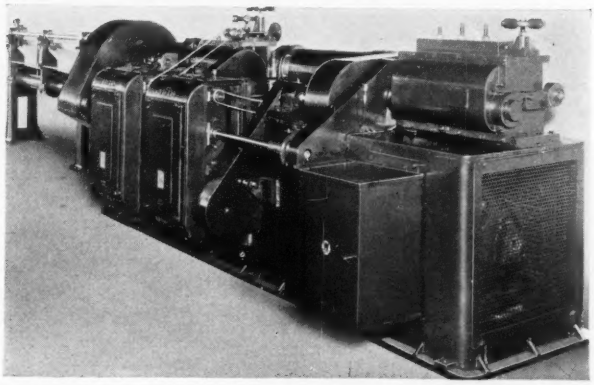
THE Machine is of Unit construction, the preliminary straightening roll housing, the feed roll unit, the rotary flier, and the cut off mechanism, as well as the Variable Speed Units are all mounted on a welded steel base.

✦ ✦ ✦

IT is equipped with a preliminary roll straightener to remove the coil bow and rough straighten the wire before it enters the rotary flier. A standard 5 die steel rotary flier is used for the finishing operation, and the straightening dies can be made of hard iron, bronze, babbitt or any other material suitable for the wire being handled. The flier is equipped with square type straightening dies, and patented guides between, which permit feeding the wire through the machine.

✦ ✦ ✦





THE gear drive for the preliminary rough straightener, and the feed roll units are fully enclosed, and run in oil.

✦ ✦ ✦

THE straightening flier, feed and straightening shafts are mounted in Timken Roller Bearings, and the drive shafts are mounted in Norma Hoffman Ball Bearings.

✦ ✦ ✦

THE new type of extension support brackets are mounted on steel pipe. The support brackets are constructed to hold the cut lengths of wire away from the machine, so they can readily be removed with a crane.

THE Guide Bar cover is operated by a separate cam, independent of the cut off cam, and the Guide Bar itself is stationary, being fastened to the extension supports.

✦ ✦ ✦

THE machine can be furnished with a front feed roll unit, containing a single pair of feed rolls, or with a double unit.

✦ ✦ ✦

THE Variable Speed Units may be eliminated, making a constant speed machine, if desired, retaining all the anti-friction features and other improved engineering features throughout the machine.

✦ ✦ ✦

IT is made in several sizes by The F. B. Shuster Company, of New Haven, Conn.

Join the Wire Association

Annual Dues $10.00 — Includes:

1. The cooperative, confidential services of the Association through which members exchange ideas without identities being revealed and endeavor to help each other in plant management and process problems.
2. Participation in all Meetings of the Society.
3. A copy of the ANNUAL WIRE BUYERS' GUIDE AND YEAR BOOK OF THE WIRE ASSOCIATION.
4. A subscription for one year to the designated official publication of the society, WIRE AND WIRE PRODUCTS.

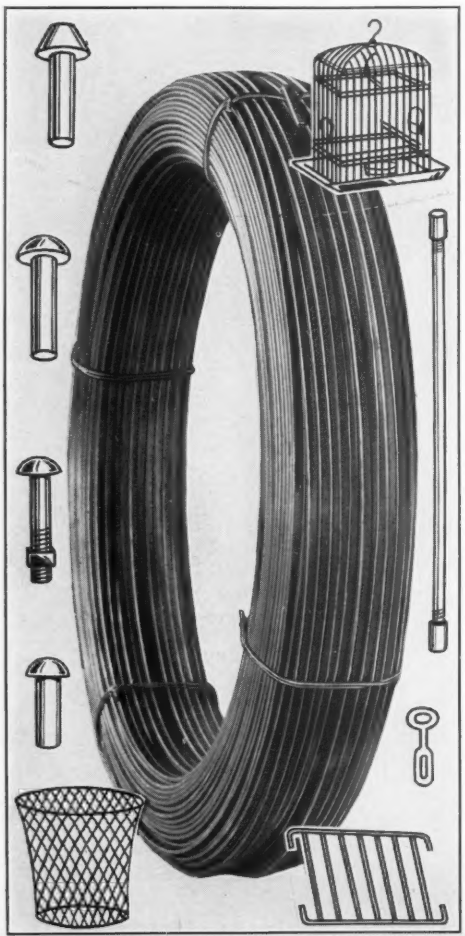
Make Your Plans Now to Attend
THE ANNUAL
WIRE ASSOCIATION MEETING
AND CONVENTION
To Be Held
At ATLANTIC CITY, N. J.
OCTOBER 18th to 22nd, 1937

CONTINENTAL WIRE

to Your Specifications

STRENGTH • TEMPER • FINISH

● Continental Wire is made from Basic Open Hearth Steel, either in plain carbon steel, copper-bearing steel, or Konik Metal. It is regularly supplied to meet a wide range of requirements and our metallurgists are always prepared to assist manufacturers in stepping-up production, reducing waste, and improving the quality of their wire products.



FINISHES

Bright, Extra Bright, Light, Medium or Heavy sull. Oiled and many other finishes for special needs.

COATINGS

Galvanized, Standard, Satin Finish, and "Flame Sealed."

ANNEALED

Pot annealed, Box annealed, and Lead annealed.

PROCESSED

To your specifications.

TEMPERS

Hard, Medium hard, or Soft.

SHAPES

Round, Square, Flat, Triangular, Oval, Half-round, Half-oval, and many other shapes.

Continental wire is furnished straightened and cut, or in coils, to best meet the requirements of manufacturers.

CONTINENTAL STEEL CORPORATION

KOKOMO, INDIANA

Manufacturers of Billets, Rods, Wire, Barbed Wire, Nails; Lawn, Chain-Link, Diamond Mesh, Farm and Poultry Fence; Gates; Black, Galvanized, Galvannealed and Special Coated Sheets; Galvanized Roofing; also "Seal of Quality" Roofing and Kindred Products.

Outstanding Personalities of the Wire Industry

C. M. Young, President, L. A. Young Spring & Wire Corp.

THE L. A. Young Spring and Wire Corp. recently announced the election of C. M. (Bud) Young to the presidency of the company. **L. A. Young** relinquishes his duties as president and general manager but continues with the corporation as chairman of the board.

✦ ✦ ✦

THE new president, nephew of L. A. Young, is only 30 years old and will be the youngest president and youngest top executive in the automotive field.

✦ ✦ ✦

ALTHOUGH extremely young for so responsible a post Bud Young has wide experience. He put on overalls and went to work in the shop of the Young company at an early age, became known to the workmen in all departments as Bud and still is known to them by that nickname. After several years in the factory he joined the sales, executive and administrative staff.

✦ ✦ ✦

TURNING over the position of president and general manager to the younger man, L. A. Young said, "leaves me more time and relieves me of all the detail work which goes hand in hand with a company as large as ours. In turn this leaves me with more time for concentrated planning and general experimental work. It gives me more time for work in my own personal laboratory."

✦ ✦ ✦

THE corporation is the world's largest makers of automobile cushion and back-spring construction, mechanical springs of all kinds and diversified wire products. It has factories in Oakland, Los Angeles, Detroit, Windsor and Toronto.

✦ ✦ ✦

George S. Whyte Elected Chairman Macwhyte Co.

GEORGE S. Whyte who has been president of Macwhyte Company since its establishment in 1901, has been elected to the new office of chairman of the board.

His son Jessel S. Whyte succeeds him to the presidency. Robert B. Whyte, brother of the retiring president, has been elected vice-president in general charge of factory operations. The company manufactures wire rope and cable.

✦ ✦ ✦

J. P. Boore, Asst. Gen'l. Sales Manager of Babcock & Wilcox Tube Co.

J. P. Boore, for several years vice president of Summerill Tubing Co., and for 20 years prior to that associated with Pittsburgh Steel Co., has been named assistant general sales manager, Babcock & Wilcox Tube Co., Beaver Falls, Pa.

✦ ✦ ✦

R. E. Zimmerman Head of U. S. Steel Research Sails for Europe

R. E. Zimmerman, vice president in charge of metallurgy and research of the U. S. Steel Corporation, recently sailed for Germany, France and England. Mr. Zimmerman will study developments in the technology of processes for the production and treatment of various grades of iron and steel. He plans to attend the Exposition at Dusseldorf, Germany, and the International Exposition in Paris.

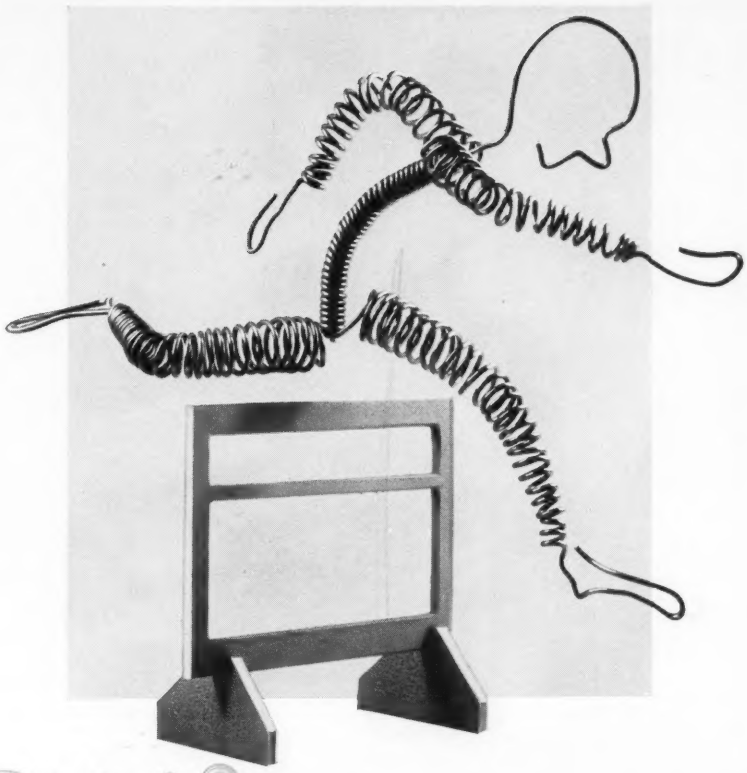
✦ ✦ ✦

Charged Agricultural Fences

(*Continued from Page 364*)

After a heavy rain the wooden posts may cause a low leakage path for the current. With a utility power supply available, 110 volts, a.c. have been applied to the wires, though this is less dangerous than using 32 volts, transformed by a low capacity transformer of about ½ to 2 k.v.a. The danger point is mentioned here, because stray animals have been known to meet with accidents in encountering charged wires, 110 volts and above. However, 32 volts or lower are safe enough. On independent farms, privately owned generators generally deliver low voltage direct current, which voltage would probably be suitable for the electrical fence without further accessories. As a final suggestion, two or three 6 volt dry cells will maintain several miles of fences for a period of 2 or 3 months.

(*Please turn to Page 376*)



Wire that *clears* Production Hurdles

Obstacles such as welding, bending, forming and finishing sometimes stand in the path of smooth, economical production of wire products. But Keystone technicians can develop for you wires that skim over those hurdles without a hitch. Possibly Keystone can produce a wire that works better than that you're using now . . . or can give you more perfect uniformity. It's worth finding out. Write . . . and the burden of proof is on us.

KEYSTONE

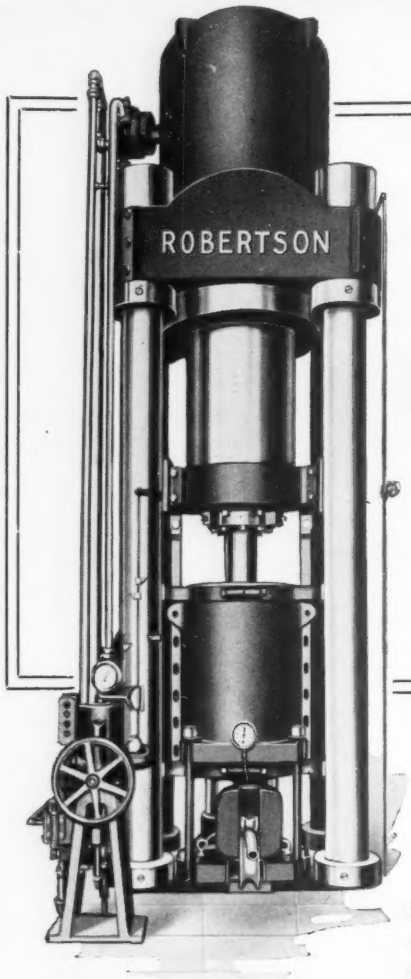
STEEL & WIRE CO. Dept. W., Peoria, Ill.

HIGH CARBON or LOW CARBON

SAMSON SPRING WIRE

KEYSTONE STEEL & WIRE CO. PEORIA, ILL.

Bright . . . Tinned
Coppered
Annealed
Galvanized



Robertson

CABLE ENCASING PRESS

in Capacities from
650 to 2500 tons

•

Efficiently Engineered,
Well Built,
An Enduring Investment

Built by master craftsmen Robertson Cable Encasing presses will give you the very minimum operating and maintenance costs — while maintaining the most exacting production rate through years of punishing service!

Broad statements, those?

We back them with a reputation for quality and integrity gained through over 78 years' specialization in the production of equipment of advanced design and performance values.

Just write for proof NOW while you think of it. There's no obligation, of course.

Who Use Robertson Presses?
National Electric Products Company
For example, is one of the Leaders who are our customers.

Other Robertson Products

Robertson makes all types of lead-encasing machinery required by rubber hose makers including Extrusion Presses, Hydraulic Pumps, Melting Furnaces and Pots, Dies and Cores, also Lead-Sheath Stripping Machines and Hydro-pneumatic Accumulators.

John ROBERTSON CO. INC.
Pioneers~Since 1858
125-37 Water Street Brooklyn, N. Y.

Charged Agricultural Fences

(*Continued from Page 375*)

THE advantages of low-cost, flexible bare wire fences are obvious. They could be built to follow the most irregular ditches, mounds, and ravines, and at all locations they will maintain a healthy respect on the part of the livestock. The farmers have taken a decided interest in this type of fence. As for erection, the construction and the 'stringing' of wires are so simple, that the purchaser usually undertakes this part of the task himself.

✦ ✦ ✦

AS for suitable wire for outdoor exposure, attention is invited to the frequent tests of the A. S. T. M. and those conducted by the Bureau of Standards. A zinc coating will prove the least expensive for the majority of cases, and satisfactory for inland territories.

✦ ✦ ✦

New Brown Co. Meter Catalog

THE Brown Instrument Company has just published a new catalog on Brown CO_2 Meters. This new catalog (No. 3005) covers the complete line of Indicating and Recording CO_2 Meters as well as the combined CO_2 and Flue Gas Temperature Recorders.

✦ ✦ ✦

A SCHEMATIC diagram on pages 12-13 illustrates the operating principle of the Brown CO_2 Meter and describes the passage of the flue gas through the various units.

✦ ✦ ✦

COPIES of this catalog will be sent upon request, address The Brown Instrument Company, Wayne & Roberts Avenues, Philadelphia, Pa., and ask for Catalog No. 3005.

The 1937 Meeting of
the Wire Association
Will be Held at
Atlantic City, N. J.
October 18 to 22, 1937

The Futility of Federal Wage And Hour Regulation

"THE minimum wage specified in the proposed Federal wage and hour law will tend to become the maximum—skilled labor will have to submit to a scaling down of wage differentials if the purpose of the Act is to be realized," according to Allen W. Rucker and N. W. Pickering, business economists, in a recently published analysis of the Black-Connery Industrial Control Bill. The analysis appears in the current booklet publication of Farrel-Birmingham Company, Inc., Ansonia, Conn., which notes that:

✦ ✦ ✦

"THE Act, in effect, declares that unemployment can be corrected by limiting the work week, and labor's income increased by raising the minimum hourly wage rate. Thus, its sponsors assume that the aggregate total of industrial payrolls can be enlarged by the over-simplified device of paying out such sums at a higher rate per hour. The fact is, however, that the annual total of manufacturing payrolls is strictly limited by natural forces beyond the control of man, thus;

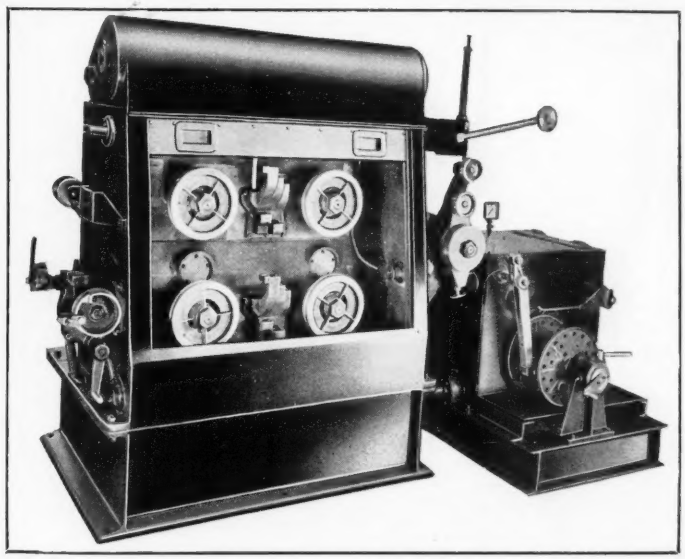
✦ ✦ ✦

"AT no time since 1920 has the annual total of manufacturing payrolls been able to rise above the total farm income. Nor has it fallen seriously below that income. The rapid rise of wage rates during the inflationary boom of the '20s, the wage-maintenance program of the Hoover Administration and the subsequent Recovery legislation of the present incumbents alike failed to have the slightest direct influence upon the annual total of manufacturing payrolls. Throughout that period the total was limited, if not actually determined by total farm income. The figures are informative.

(*Please turn to Page 378*)

ES

HIGH SPEED WIRE DRAWING EQUIPMENT



Type C-12 Light Intermediate Wire Drawing Machine

This machine can draw copper, bronze or brass.

Maximum size of entering wire	# 8 B & S gauge
Size of finished wire	#18-#26 B & S gauge
Maximum operating speed	4000 F.P.M.
Number of drawing dies	12 (minimum slip)
Number of drawing block shafts	4
Maximum motor size	50 H.P.

A **COMPLETE** line, minimum slip, built primarily for high speed drawing — built for long life, efficient operation, economical production and clean and excellently wound quality wire.

High Speed Insulating Machines For Use With Paper — Cotton — Silk

Saturating and Finishing Equipment For Weather-proof and Code Wire

Taping Machines for Cambric and Paper, etc.

Take-ups — Spoolers — Coilers

Complete Tinning Equipment

Other Equipment for Producing Wire and Cable

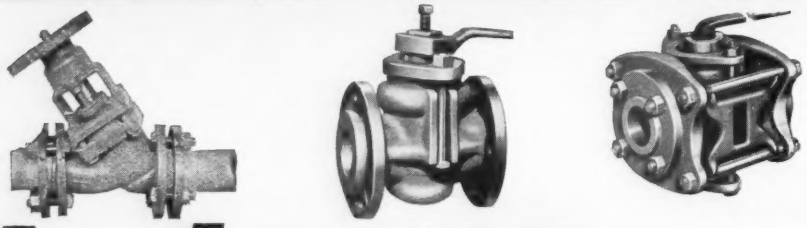
Let us show you what our equipment can do towards cutting production cost and improving quality.

ELEVATOR SUPPLIES COMPANY, Inc.

RAHWAY, N. J.

EXECUTIVE AND SALES OFFICE
420 LEXINGTON AVE., NEW YORK, N. Y.

WORKS
RAHWAY, N. J.



VALVES
for Acid Solutions

Above, left to right, the Duriron Y valve, Duriron "Plunger-Release" valve, Duriron lubricated plug valve.
All of them, being made of Duriron, are highly resistant to most corrosive solutions used in Industry. They are economical to use; save time and money usually spent on replacements of cheaper and less resistant valves. The following sizes are carried in stock—special sizes made to order promptly.

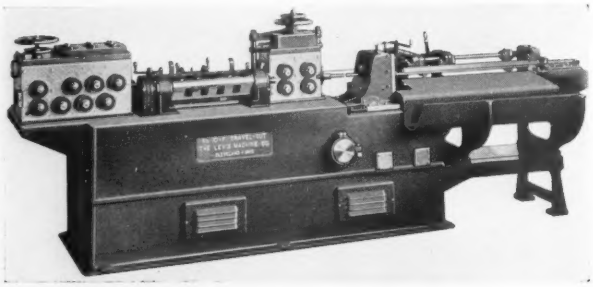
Y Valves: ¾", 1", 1½", 2", 3", 4", 6".

P. R. Valves: 1", 1½", 2", 3", 4".

Lubricated Valves: 1", 1½", 2", 2½", 3", 4", 6".

THE DURIRON COMPANY, Inc.
445 N. Findlay St. Dayton, Ohio

LEWIS HEAVY-DUTY WIRE MACHINES



No. 10-F "Travel-Cut", ⅝" Capacity

Lewis high speed, heavy duty, automatic wire straightening and cutting machines are built to meet the most accurate mill requirements on ferrous and non-ferrous wire. Machines are modern in every respect. They are equipped with anti-friction bearings throughout, heat-treated alloy-steel gears, fully enclosed feed and straightener housings, and are available with sliding gear transmissions.

Machines for Handling Wire Sizes From $\frac{1}{32}$" to ¾" — Write for Bulletin

THE LEWIS MACHINE COMPANY
3440 E. 76 ST. — CLEVELAND, O.

Federal Wage And Hour Regulation

(*Continued from Page 377*)

	Farm Income	Payrolls
	In Billions of Dollars	
1921	$ 8.93	$ 8.20
1923	11.04	11.01
1925	11.92	10.73
1927	11.12	10.85
1929	11.94	11.62
1931	6.97	7.17
1933	6.24	5.26
1935	7.23	7.22

✦ ✦ ✦

Payrolls are Limited

"THE total wage disbursements of manufacturers are thus determined by natural forces beyond control and cannot be enlarged **by fiat**. Within the annual payroll aggregate set by natural forces, more employment hours automatically mean a reduction in the average hourly wage rate; an increase in the minimum and hence the average hourly wage rate, automatically reduces the total man-hours of labor available. There can be no increase in the number of slices from a pie, as well as in the size of each slice, unless the pie itself is made larger.

✦ ✦ ✦

"TO pay for the twenty billion man-hours of labor needed to provide full-time employment to the ten million wage-earners available for manufacturing alone, would require that the average hourly wage rate drop from the current 66c an hour to 42½c per hour! Or,

✦ ✦ ✦

"TO employ ten million persons in industry without levelling the average hourly rate to 42½c would necessitate that each individual be limited to not more than 1360 hours per annum, or an average of 27.2 hours per week."

✦ ✦ ✦

THE booklet containing the complete study includes a table showing what average wage rates would have to be in order to provide full-time employment for available labor, at different levels of total farm income.

WIRE ASSOCIATION

New Members to June 15

BEVERIDGE, N. G., Mgr., Wire Works Dept.,
Union Steel Corp, (S. A.) Ltd.,
Vereeniging, Transvaal, South Africa.

DAY, JAMES, Sales Engineer,
Selson Machine Tool Co., Ltd.,
London, S. W. 1, England.

GIRVEN, J. E., Wire & Cable Engr.,
Canadian General Electric Co., Ltd.,
Peterborough, Canada.

HARVEY, C. L., Chief Metallurgist,
Lamson & Sessions Co.,
Kent, Ohio.

HOLMQUIST, JOHN A.
Aliquippa, Pa.

HUME, W. G., Manager
Wire Products Sales,
Pitttsburgh Steel Co.,
Pittsburgh, Pa.

IVES, C. G., Plant Superintendent,
The Acme Wire Company,
New Haven, Conn.

KENYON, HAROLD G., Div. Supt.,
General Electric Co.,
Pittsfield, Mass.

LAWRENCE, J. B. Sales Representative,
The Ironsides Company,
Columbus, Ohio.

LYTLE, B. H., Manager Feeder Div.,
Westinghouse Elec. & Mfg. Co.,
East Pittsburgh, Pa.

NOWELL, H., Representative,
Sir James Farmer Norton & Co., Ltd.,
Montreal, Ontario, Canada.

OLSON, ROBERT V., President,
Mossberg Pressed Steel Corp.,
Attleboro, Mass.

PRICE, W. B., Ch. Chemist & Metallurgist,
Scovill Manufacturing Co.,
Waterbury, Conn.

ROBERTSON, H. J., Secy.-Treas.
Port Wentworth Corp.,
New York City.

RUSSELL, RAYMOND F., Gen. Mgr.,
Sleeper & Hartley, Inc.,
Worcester, Mass.

SENDZIMIR, T., Director,
Metallurgical Products Co., Ltd.,
Guernsay, C. I.,
Paris, 17e, France.

SHILLING, J. H., Supt. Wire Div.,
Youngstown Sheet & Tube Co.,
Youngstown, Ohio.

TANG, S. Y., General Manager,
Canton Metal Window Mfg. Co.,
Honan, Canton, China.

WARNER, CHAS. M., Supt. Wire Mill,
Scovill Manufacturing Co.,
Waterbury, Conn.

WELSH, J. ALAN, Sales Engr.,
Firth-Sterling Steel Co.,
McKeesport, Pa.

✦ ✦ ✦

Wire Association Questions —

Question 3026

We understand that there is now being imported into the United States a particular type of barb wire made of carbon wire with high tensile strength, manufactured by the Krupp Works of Germany.

We have been unable to verify this information and would request that any member of the Wire Association knowing about it, furnish us with particulars about this wire and, if possible, with a sample.

✦ ✦ ✦

Editor's Note—Any member of the Association who can give information on the above is requested to write to the Secretary of the Wire Association.

The 1937
Wire Association Meeting
Will be Held at
Atlantic City, N. J.
October 18th to 22nd, 1937

FOR WIRE DRAWING

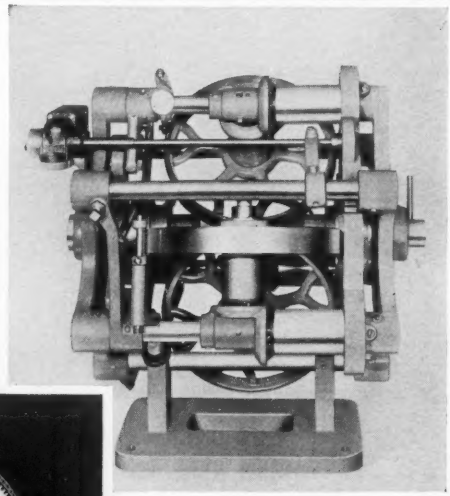
Warner — Founded 1794 — Sand-Gravel Lime Products

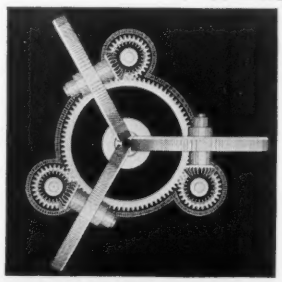
- *Bell-Mine Pulverized Lime is especially well suited for regular use in wire drawing processes . . . .*
- *It is free from grit and has guaranteed high lime content. It is unusually slow settling in the milk of lime box . . . . . .*
- *It is truly economic . . .*

WARNER COMPANY BELLEFONTE DIVISION
SALES OFFICES: PITTSBURGH, PHILADELPHIA, BELLEFONTE, N. Y. CITY

If you want . . . . . .
ACCURATE MEASURE

. . . this is the measuring machine you *must* use. Shows *exact* linear measurement of bare, insulated, twisted pair, oval, odd-shaped, cable. Absolutely accurate at any speed! Speeds up production; saves loss and waste.





EXCLUSIVE "3-V" PRINCIPLE
A patented feature of Lyon Measuring Machine, gives absolute accuracy—permits high speed operation—eliminates vibration, slippage, error.

WRITE!
Inquiries and your fullest investigation invited.

Lyon-Vail Special Machinery — LYONBILT
BROCKTON · MASSACHUSETTS · U. S. A.

WHOEVER UNDERSTANDS GERMAN

Should Read

"Draht-Welt" (Wire World)

A weekly for the wire industry
and related lines.

Subscription price: Rm. 6.50 quarterly

Sample copies free on request from:

Martin Boerner — Verlag
Halle — Saale
Germany

Dies for
High Speeds
Long bearing Dies
Short bearing Dies
Special bearing Dies
FAMOUS
WIRE DRAWING DIAMOND DIES

VIANNEY

250 E. 43rd St. · New York

Largest Stocks in U.S.A.
Quickest Deliveries
Safest Guarantees
Best Selections
Lowest
Costs

W. H. Swanger and G. F. Wohlgemuth to Be Awarded A. S. T. M. Dudley Medal

W. H. Swanger, Chief, Section of Mechanical Metallurgy, and Assistant Chief, Division of Metallurgy, and **G. F. Wohlgemuth,** Associate Metallurgist, respectively, National Bureau of Standards, have been chosen as winners of the Charles B. Dudley Medal for 1937. This medal, which commemorates the name of the first A. S. T. M. President (1902-1909), is awarded to the author or authors of the paper presented at the preceding annual meeting which is of outstanding merit and constitutes an original contribution on research in engineering materials. The medal will be awarded to Messrs. Swanger and Wohlgemuth on June 30 during the Fortieth A. S. T. M. Annual Meeting in New York City.

✦ ✦ ✦

THE winning paper entitled **"Failure of Heat-Treated Steel Wire in Cables of the Mt. Hope, R. I., Suspension Bridge"** described the extensive work undertaken at the National Bureau of Standards to determine the causes of the failure.

✦ ✦ ✦

SEVERAL months after completion of the spinning of the cables, but before completion of the bridge structure, so many fractures occurred in the cable wires at the anchorages that it was necessary to dismantle the partially completed bridge. The same heat-treated wire was being used in the Ambassador Bridge, Detroit, and this bridge, too, was dismantled. The wire from both bridges was replaced with the conventional cold-drawn wire and no failures of wires in either bridge have been reported since their completion.

✦ ✦ ✦

BECAUSE of the high elastic limit of the heat-treated wire, it was "preformed" around the anchorage so that it would "lay dead" against the shoe. The investigation at the Bureau developed that most of the loops did not have the curvature of the shoes and many had reversed curves resulting in higher elastic bending stresses than if they had not been preformed at all. The authors in their paper indicated that "the way in which the failed wires were placed on the anchor shoes, the high elastic limit of the material, and the fluctuating loads on the wires while the cables were spun and the bridge structure was being erected combined to produce a range of elastic bending stresses in the wires at the anchor shoes. The uniformly fine-grained steel of the wire, surrounded by the brittle, low-strength zinc-iron alloy of the galvanized coating, and with numerous surface imperfections acting as points of stress concentration offered inadequate resistance to the repeated elastic bending stresses. Fatigue fractures originating at the surface of the wires were the result. There was definite evidence that the fibrous structure of the cold-drawn wire tended to turn aside such cracks, whereas the hard fine-grained structure of the heat-treated wire could not act in this way."

MR. **Swanger** is a graduate of Pennsylvania State College, B. S. degree in chemistry, 1917. After a short period of employment in the Research Department of New Jersey Zinc Co., he entered military service from August 1917 to September 1919. He then was re-employed with the New Jersey Zinc Co. until January, 1921, when he became affiliated with the National Bureau of Standards in the Chemistry Division. In 1927 he was transferred to the Division of Metallurgy. His work has involved platinum metals, special high-temperature refractories, thermal conductivity of metals, fatigue testing and investigations of failures of metals. In addition to his membership in A. S. T. M., he is a member of the American Society for Metals and is chairman of the Washington Chapter, A. S. M., 1937-1938.

✦ ✦ ✦

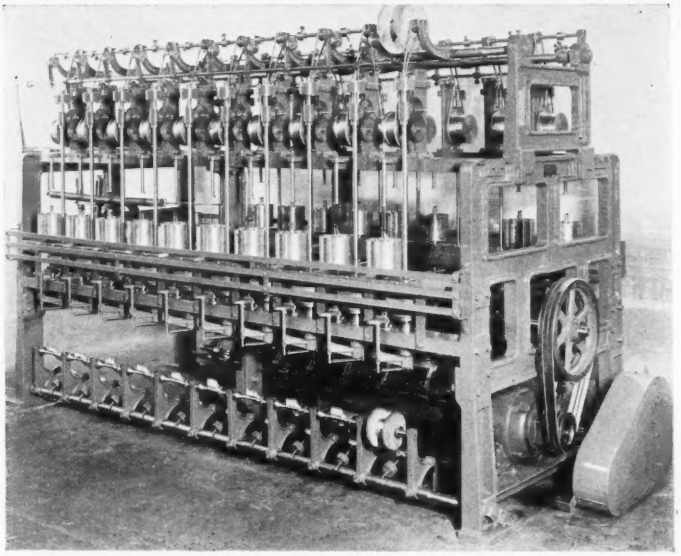
MR. **Wohlgemuth** was graduated from St. John's College, Annapolis, Md., 1919, with a B.S. degree. Until May, 1930, he was employed at the U. S. Naval Engineering Experiment Station and was associate Metallurgist from 1923 until 1930 when he became Associate Metallurgist at the National Bureau of Standards where he continued his work in the physical and metallurgical properties of metals and investigations of metals failures. He is a Captain in the Chemical Warfare Service Reserve, U.S.A. In June, 1936, he received his M. S. degree, in course, from the American University in Washington.

✦ ✦ ✦

Pacific Wire Products Company New Building

PACIFIC Wire Products Co., has started construction of a factory building at a cost of $500,000. The plant will be erected on a 7-acre site in the 1300 block on Alameda Street, Los Angeles, Calif. The plant will be equipped for the fabrication of screen wire.

Now Ready
The 1937 Wire Buyers' Guide and Year Book of the Wire Association
Price $5.00 per Copy



EST. 1855 AIMCO INC. 1915
"American" INSULATING MACHINERY COMPANY
REG. U.S. PAT. OFF.
517 West Huntingdon St.
PHILADELPHIA PENNSYLVANIA U.S.A.

A SIMPLE, efficient, compact, high speed Insulating Machine applying cotton, silk, paper, or transparent films with equal facility, either single or double cover.

Maintenance cost is low and price is MODERATE.

NORBIDE ABRASIVE . . .

The choice of users of carbide dies for economical shaping, ripping and finishing.

NORTON COMPANY, WORCESTER, MASS.

N-32

NORTON ABRASIVES

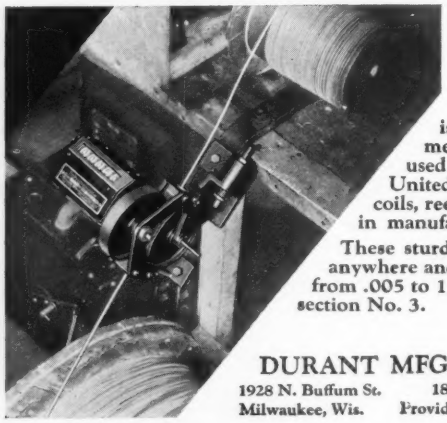
No. 4285
Portable Kelvin Bridge

HIGH ACCURACY IN WIRE RESSTANCE MEASUREMENTS

A convenient, portable instrument, this Kelvin Bridge is ideal for rapid, yet highly, accurate routine measurements of wire resistance. Its limit of error is ¼ of one per cent; its range 0.001 ohm to 25.5 ohms.

J-EF22-53(1)

LEEDS & NORTHRUP COMPANY
4974 STENTON AVENUE PHILADELPHIA, PA.
LEEDS & NORTHRUP



THE ONLY WAY TO MEASURE WIRE ACCURATELY

is to run it through a dependable wire measuring machine. *Productimeters* are used in most of the wire plants of the United States for getting accurate footage on coils, reels, and spools, measuring off wire, and in manufacturing wire products.

These sturdy, accurate, machines can be mounted anywhere and are adapted to wire, cable and rope from .005 to 1½" in diameter. Send for catalog section No. 3.

DURANT MFG. CO.
1928 N. Buffum St. Milwaukee, Wis.
180 Eddy St. Providence, R. I.

Productimeters
THE SPEEDOMETERS OF INDUSTRY

BALLOFFET

The Quality Diamond Dies Since 1870

Balloffet Dies and Nozzle Co., Inc.

45-47 Adams Street Guttenberg, N. J.

STEEL WIRE

By MAURICE BONZEL

A NEW BOOK ABOUT WIRE!

495 pages. 414 charts, photomicrographs and illustrations

Translated and Published by Kenneth B. Lewis, Consulting Engineer
Price $15.00

SEND ORDERS TO

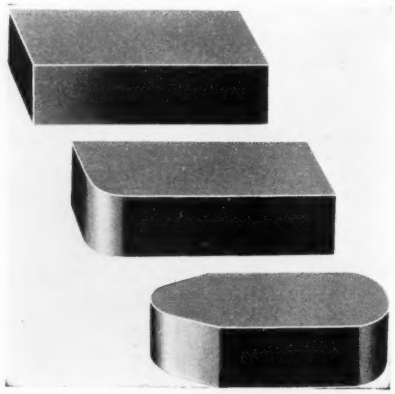
WIRE and WIRE PRODUCTS

17 E. 42nd STREET, NEW YORK

Carboloy Announces New Standard Blanks at Reduced Prices

CARBOLOY Company, Inc., manufacturers of cemented carbide tools, dies and wheel dressers, announce the development of 3 styles of standard blanks available at reduced prices. The 3 styles in 96 sizes have been designed for wide application, based upon experience with thousands of carbide tool applications. They are adaptable for use on more than 90% of all carbide tools in use today. In many cases, simple revisions in tool design will enable users to use these standard blanks at a substantial saving in carbide cost. These savings will apply to standard blanks used by manufacturers in making their own tools, or used in "Milled and Brazed", or "Finished" tools.

✦ ✦ ✦



A NUMBER of definite advantages are offered to those using Standard Blanks: (1) Savings of 15% and up on the price in any grade. (2) Large-quantity prices on small quantity orders. (3) Immediate deliveries. (4) Reduction in designing time and blank cost by using blanks shaped to proven tip proportions, and (5) Wide adaptability offers users a chance to group purchases on larger quantities.

✦ ✦ ✦

IN addition to the special price reduction on Standard Blanks in any quantity, a special reduction has also been made on special blanks in quantities of 500 or over. Special blanks are all blanks other than the 3 standard styles.

✦ ✦ ✦

THESE are not general price reductions but instead, special

reductions made possible through the quantity production. The base price remains at 45c per gram.

✦ ✦ ✦

A FULL explanation, together with the new, low standard blank prices, description of standard tools, and full scale drawings of the 96 standard blanks in 3 styles, is contained in a new 28-page catalog M-37—available upon request to Carboloy Company, Inc., 2985 East Jefferson Avenue, Detroit, Michigan.

✦ ✦ ✦

Cold Heading Problems

(*Continued from Page 361*)

burization, ofter as much as .010-.015″ carbon free. One coil of such material in a carload shipment, if not caught before heading, may cause the rejection of a large shipment of bolts. I believe that such a condition is caused by carelessness and cannot be too severely condemned.

✦ ✦ ✦

I HOPE that you will not conclude from my remarks that I am a rank pessimist and that all is wrong with the world. The contrary is true. The heading industry is entering a new and prosperous era. Products are being made today that could not have been made ten years ago due to lack of the proper materials and the end is not yet in sight.

✦ ✦ ✦

WHAT I have attempted to do is point out three items of mutual interest on which our efforts might be concentrated. Any developments along the lines of wire coatings, elimination of surface defects, and reduction of decarburized surface on wire, will be to the mutual advantage of the heading and the wire industries.

Manufacturers of materials, tools and equipment for wire drawing and forming plants are constantly making improvements and additions to their lines. If you do not find the product or service in which you are interested, additional information will be supplied promptly. Simply address:

WIRE & WIRE PRODUCTS
17 East 42nd Street
New York City

Learn about PARALAN

Paralan will give your finished wire and wire products protection from atmospheric corrosion in the mill and in shipping. Paralan-coated wire can be spot welded or soldered without cleaning. Also, Paralan leaves surfaces in good condition for all types of finishes—enameling, japanning, lacquering, plating, etc.

Write for further information. We may be able to solve your difficulties.

AMERICAN LANOLIN CORP.
LAWRENCE, MASSACHUSETTS

STEELSKIN

REG. U. S. PAT. OFFICE

For High or Low Carbon Wire

WIRE DRAWING SOAPS

Established 30 years

R. H. MILLER CO., Inc. **Homer, N. Y.**

Become Quality Conscious

For Larger Bundles, Higher Production and Lower Prices, Use

RUSCH DIAMOND DIES

RUSCH WIRE DIE CORPORATION

275 SEVENTH AVENUE, NEW YORK, NEW YORK

The All-American Made Diamond Die

TRADE MARKS

Does your product bear a distinctive trade mark? If so, can you prevent competitors from using it? Have you registered it in the United States Patent Office? A patent on the product is not necessary in order to register its trade mark in the Patent Office. Write us for information on trade marks and the Federal registration that entitles you to display with your trade mark, the notice "Reg. U. S. Pat. Off."

Lancaster, Allwine & Rommel

Registered Patent and Trade Mark Attorneys

438 Bowen Bldg.—815 15th St. N. W. Washington, D. C.

FOR DRY AND WET DRAWING

Wire Drawing Soaps

Successfully meet recent special demands made by high-speed drawing and the added attention given to brightness and finish.

Send for special Wire Drawing Bulletin.

FOR FERROUS, NON-FERROUS WIRE

MAGNUS CHEMICAL COMPANY 188 South Avenue, Garwood, N. J.

Think of it!

95%

of the pickling rooms of the world

use

RODINE

in the pickling bath to save money and produce a better product.

If you have a metal finishing problem--pickling--cleaning -- painting -- consult our experts--Service Free.

AMERICAN CHEMICAL PAINT CO.
AMBLER PENNA. Detroit 6339 Palmer Ave., E.

Duriron Issues General Catalog

THIS is the first general catalog ever published of equipment made exclusively for handling corrosive solutions. It is also the first catalog to contain as complete a line of corrosion-resisting equipment. An attempt was made to illustrate and describe as many items as possible. Where applicable, complete data as to sizes, capacities, dimensions and engineering data have been given.

✦ ✦ ✦

THE treatment of the cover is a little unusual. The cover is **impregnated** with **cellophane** to withstand handling and exposure to soil without permanently marring its appearance.

THE catalog is available to you by writing to The Duriron Company, Inc., Dayton, Ohio.

✦ ✦ ✦

New Flamenol Cable Introduced by General Electric

A NEW synthetic insulating compound has been recently introduced commercially by the General Electric Company under the trade name Flamenol. While similar to rubber in its characteristics, it contains no rubber and will not support combustion.

✦ ✦ ✦

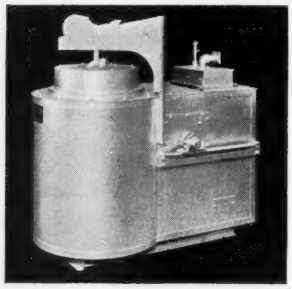
TERMED the most radical cable development in the last 25 years, Flamenol is entirely different from any insulation previously available. In addition to being non-combustible it is highly resistant to moisture, acids, alkalies, and oils. It has excellent aging characteristics and is strong mechanically.

✦ ✦ ✦

THE properties of Flamenol are such that it can be made a very soft and flexible compound, or made to be one with celluloid-like rigidity. It can be put into solution for coating or impregnating, and can be compounded, filled, calendered, and extruded in much the same fashion as rubber.

✦ ✦ ✦

FLAMENOL-insulated cable is recommended for power and control circuits at 600 volts and less, and for operation at a maximum copper temperature of 60 C. It is well adapted to machine-tool wiring, switchboard wiring, and battery and coil leads. Flamenol has a permanently smooth finish and foreign materials do not readily adhere to its surface. It is available in a variety of colors for circuit tracing. For most applications Flamenol is used without any projective finish, such as braid, lead, or armor. It is only where the cable will be subjected to extreme mechanical abuses that such a finish is necessary.



Lindberg CYCLONE Tempering Furnace

Revolutionary advance in furnace design which gives new high efficiency in production.

Cyclone action forces heat directly through the densest charge, producing increased speed and uniformity in tempering.

Cyclone construction withstands unusual abuse, reducing production delays and maintenance costs to a minimum.

Electric and Gas Fired Types with Precision Control. Bulletins on request.

Lindberg Engineering Co.
923 UNION PARK COURT CHICAGO, ILLINOIS

Offices In Principal Cities
CANADA: WILLIAMS & WILSON, Ltd.

Premier
TRADE MARK REG. U.S. PAT. OFF.
Diamond Dies

Premier Diamond Dies are made of specially selected stones shaped and formed for every requirement. These dies are cased so as to form a tool that is virtually a single seamless unit.

Premier Dies are so constructed that they will draw to uniform size under heavy pressure without flawing or breaking.

PREMIER

DRIVER-HARRIS COMPANY
HARRISON - NEW JERSEY

FOLDED PAPER FLATS
PAPER INSULATION YARNS
TWISTED "CELLOPHANE" YARNS
E. W. TWITCHELL, INC.
3rd & Somerset Sts. Phila., Pa.

ZINC STRIP AND WIRE
THE PLATT BROS. & CO.
WATERBURY, CONN.

RUESCH
Machinery For
Wire, Tube, And Brass Mills
409 Mulberry St., Newark, N. J.

Broden Construction Co.
Wire Mill and Cold Rolling Equipment
11730 Harvard Ave.
CLEVELAND, OHIO

WIRE DRAWING MACHINERY AND EQUIPMENT
Rod Frames — 16″ Frames, 8″ Frames — Take-Up Frames, Wire Pointers—Puller Tongs.
General Castings for Wire Mill use.
Circulars on Request.
E. J. SCUDDER FOUNDRY & MACHINE CO.
TRENTON, N. J.

SCHUMAG
CONTINUOUS ROD MAKING
STRAIGHTENING AND POLISHING MACHINES
W. A. SCHUYLER
FISK BLDG. NEW YORK

Wire Drawing Diamond Dies
COCHAUD
WIRE DIE CORPORATION
300 W. 56th St., NEW YORK
Tel. Col. 5-1340

POSITION OPEN
Metallurgist, technical graduate with practical experience in cold rolling and cold drawing of steel products. Must be capable of assuming charge of laboratory and research.
Address Box No. 25
WIRE AND WIRE PRODUCTS
17 E. 42nd St. New York, N. Y.

Flash Baking of Wire and Rods

(*Continued from Page 351*)

which should be dried quickly to avoid sull, and (2) small process wire which must now be carefully spread, and which tends strongly to rust under the lime. It is thought that in the latter case flash baking may greatly accelerate the trend toward dry drawing in fine sizes.

✦ ✦ ✦

REGARDING details of construction, the preferred location for the combustion chamber is said to be below the baking chamber. The insulated walls of the baking chamber are thick enough to enclose the ducts, and the entire unit is a compact cube. Plenty of heat must be supplied, as will be appreciated from the fact that a single-pin baker has replaced a 54 truck unit. Two to three million BTU per pin space is current practice. Contacts actuated by the weight of the yoke govern the fuel valve so no heat is wasted in empty bakers. The usual pyrometric controls and safeguards are supplied.

✦ ✦ ✦

Brown Analy-Graph

THE Brown Instrument Company has just published a new folder entitled — "Standardizes Quality in the Heat Treatment of Metals".

✦ ✦ ✦

THIS folder describes the advantages of using the Brown ANALY-GRAPH in heat treating processes. The Brown ANALY-GRAPH exactly records the minute changes in the chemical composition of furnace atmosphere—replacing guesswork with accuracy.

✦ ✦ ✦

A COPY of this folder will be sent upon request. Address: THE BROWN INSTRUMENT COMPANY, Wayne & Roberts Avenues, Philadelphia, Pa., and ask for Folder No. 92-2.

FOR SALE:
Bellis Salt Annealing Furnace for wire rods and wire. Complete with all equipment for electric immersion heating.
THE SENECA WIRE & MFG. CO.
Fostoria, Ohio

ROYLE
PATERSON N.J.
BUILDING EXTRUDERS SINCE 1880
Insulating Machinery for Western Electric Continuous Vulcanizing process.
JOHN ROYLE & SONS
PATERSON, N. J.

Kenneth B. Lewis
CONSULTING ENGINEER
Wire Mill Equipment, Layout and Practice
17 East 42nd St. New York City
43 Midland St. Worcester, Mass.
Phone: Murray Hill 2-4188
Phone 5-6033

WILLIAM GOULD, M. E.
CONSULTING INDUSTRIAL ENGINEER
INVESTIGATIONS — LAYOUTS — COSTS
WIRE DRAWING & SPRING COILING
80 Van Cortlandt Park So., New York City

Wire Mill Equipment, Stranding, Insulating, Drawing, Welding
Thomson-Judd Wire Machinery Co.
Subsidiary of
Thomson-Gibb Electric Welding Co.
Lynn, Massachusetts.

TUNGSTEN, DIAMOND, TANTALUM
DIES
KELLY
WIRE DIE CORPORATION
19 W. 34th St. New York

Continuous Straightening and Cutting Machinery
With
FLYING SHEAR
for round and shaped wire.
✦ ✦ ✦
THE HALLDEN MACHINE COMPANY
THOMASTON CONNECTICUT

Index to Advertisers

A

Ambassador Hotel 372
American Chemical Paint Co. 384
American Insulating Machy. Co. 381
American Lanolin Corp. 383

B

Balloffet Dies & Nozzle Co., Inc. 382
Bellis Heat Treating Co., The 371
Broden Construction Co. 385

C

Carboloy Company, Inc. 333
Cleveland Tramrail Division of
The Cleveland Crane & Engr'g. Co. 368
Cochaud Wire Die Corp. 385
Continental Steel Corp. 374

D

Driver-Harris Co. 384
Durant Mfg. Co. 382
Duriron Company, Inc., The 378

E

Electric Furnace Co., The ..... Back Cover
Elevator Supplies Co., Inc. 377

F

Firth Sterling Steel Co. 342

G

Glader, Wm., Machine Works 370
Gould, William 385

H

Hallden Machine Co., The 385
Hudson Wire Company 336

K

Kelly Wire Die Corp. 385
Keystone Steel & Wire Co. 375

L

Lancaster, Allwine & Rommel 383
Leeds and Northrup Co. 382
Lewis, K. B. 385
Lewis Machine Co., The 378
Lindberg Engineering Co. 384
Lyon-Vail Machine Co., Inc. 379

M

Magnus Chemical Co. 384
Micro Products Company 366
Miller, R. H., Co., Inc. 383
Morgan Construction Co. 334

N

Norton Co. 381

P

Pittsburgh Steel Co. 335
Platt Brothers & Co. 385

R

Robertson, John, Co., Inc. 376
Royle, John, & Sons 385
Ruesch Machine Co., H. J. 385
Rusch Wire Die Corp. 383

S

Schuyler, W. A. 385
Scudder Foundry & Machine Co., E. J. 385
Seneca Wire & Mfg. Co. 385
Seymour Mfg. Co. 339
Shuster, F. B., Co., The 369
Sleeper & Hartley, Inc. 338

T

Thomson-Judd Wire Machinery Co. 385
Torrington Mfg. Co. 367
Twitchell, E. W., Inc. 385

U

Union Wire Die Corp. 340

V

Vanadium Alloys Steel Co. 341
Vaughn Machinery Co. ..... Front Cover
Vianney Wire Die Works 380

W

Warner Co. 379
Waterbury Farrel Fdry. & Mach. Co. 337
Watson Machine Co. ..... Inside Back Cover

Y

Youngstown Sheet & Tube Co., The ..... Inside Front Cover

BUYERS' GUIDE

For more complete information, consult the annual Directory, Index & Buyers' Guide.

ABRASIVES—
Norton Co., Worcester, Mass.

ANNEALING POTS AND BOXES—
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.

ANTI-RUST—
Magnus Chemical Co., Garwood, N. J.

ARMORING EQUIPMENT—
Amer. Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Hoboken, N. J.
New England Butt Co., Providence, R. I.
Seymour Mfg. Co., Seymour, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

BAKERS—Rod and Wire
Lindberg Engineering Co., Chicago, Ill.
Morgan Construction Co., Worcester, Mass.
Morrison Engineering Co., Cleveland, O.

BORON CARBIDE—
Norton Co., Worcester, Mass.

CEMENT FLOOR CLEANER—
Magnus Chemical Co., Garwood, N. J.

CEMENTS—Refractory
Norton Co., Worcester, Mass.

CHEMICALS—Cleaning
American Chemical Paint Co., Ambler, Pa.
Magnus Chemical Co., Garwood, N. J.

CLEANERS—Hand and Metal
Magnus Chemical Co., Garwood, N. J.

CLEANING & PICKLING EQUIPMENT—
Broden Construction Co., Cleveland, O.
Duriron Co., The, Dayton, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

COATING—Protective
American Lanolin Corp., Lawrence, Mass.

COILERS—Sheet, Strip and Wire
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Ansonia, Conn.
H. J. Ruesch Machine Co., Newark, N. J.

CONDUITS—Iron and Steel
Youngstown Sheet & Tube Co., Youngstown, Ohio.

CONTROLS—Automatic
Leeds & Northrup Co., Philadelphia, Pa.

CRANES—Block Stripping
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

CRANES—Cleaning House
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

CRANES—Electrical Traveling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

CRANES—Wire Mill
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

DIAMOND TOOLS—
Rusch Wire Die Corp., New York, N. Y.

DIES—Diamond
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Cochaud Wire Die Co., New York, N. Y.
Driver Harris Co., Harrison, N. J.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Union Wire Die Corp., Stamford, Conn.
Vianney Wire Die Works, New York, N. Y.

DIES—Lead Extrusion
John Robertson Co., Brooklyn, N. Y.

DIES—Repairs & Re-Cutting
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Cochaud Wire Die Co., New York, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Union Wire Die Corp., Stamford, Conn.
Vianney Wire Die Works, New York, N. Y.

DIES—Rod and Tube Drawing
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Union Wire Die Corp., Stamford, Conn.
Vanadium Alloys Steel Co., Pittsburgh, Pa.
Vianney Wire Die Works, New York, N. Y.

DIES—Tantalum Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.

BUYERS' GUIDE, Continued

Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vanadium Alloys Steel Co., Pittsburgh, Pa.
Vianney Wire Die Works, New York, N. Y

DIES—Tungsten Carbine-
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Union Wire Die Corp., Stamford, Conn.
Vanadium Alloys Steel Co., Pittsburgh, Pa.
Vianney Wire Die Works, New York, N. Y.

DRAW BENCHES—
H. J. Ruesch Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.

ENGINEER—Consulting Wire Mill
Gould, William, New York, N. Y.
Lewis, Kenneth B., New York, N. Y.

EQUIPMENT—Insulation Testing
Leeds & Northrup Co., Philadelphia, Pa.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FILLERS—Paper for Cable
E. W. Twitchell, Inc., Phila., Pa.

FURNACE CONTROLS — Combustion
Leeds & Northrup Co., Philadelphia, Pa.

FURNACE CONTROLS—Draft
Leeds & Northrup Co., Philadelphia, Pa.

FURNACES—Annealing
Bellis Heat Treating Co., Branford, Conn.
Electric Furnace Co., Salem, O.
Leeds & Northrup Co., Philadelphia, Pa.
Lindberg Engineering Co., Chicago, Ill.
Surface Combustion Co., Toledo, O.

FURNACES—Automatic
Bellis Heat Treating Co., Branford, Conn.
Electric Furnace Co., Salem, O.
Leeds & Northrup Co., Philadelphia, Pa.
Lindberg Engineering Co., Chicago, Ill.
Surface Combustion Co., Toledo, O.

FURNACES—Bright Annealing
Bellis Heat Treating Co., Branford, Conn.
Electric Furnace Co., Salem, O.
Lindberg Engineering Co., Chicago, Ill.
Surface Combustion Co., Toledo, O.

FURNACES—Electric
Bellis Heat Treating Co., Branford, Conn.
Electric Furnace Co., Salem, O.
Leeds & Northrup Co., Philadelphia, Pa.
Lindberg Engineering Co., Chicago, Ill.

FURNACES—Hardening and Tempering
Electric Furnace Co., Salem, O.
Leeds & Northrup Co., Philadelphia, Pa.
Lindberg Engineering Co., Chicago, Ill.
Surface Combustion Co., Toledo, O.

FURNACES—Lead Melting
Electric Furnace Co., Salem, O.
Lindberg Engineering Co., Chicago, Ill.
John Robertson Co., Brooklyn, N. Y.
Surface Combustion Co., Toledo, O.

FURNACES—Non-Oxidizing
Bellis Heat Treating Co., Branford, Conn.
Electric Furnace Co., Salem, O.
Lindberg Engineering Co., Chicago, Ill.
Surface Combustion Co., Toledo, O.

FURNACES—Normalizing
Leeds & Northrup Co., Philadelphia, Pa.

FURNACES—Wire, Strip & Sheet
Bellis Heat Treating Co., Branford, Conn.
Electric Furnace Co., Salem, O.
Lindberg Engineering Co., Chicago, Ill.
Surface Combustion Co., Toledo, O.

GEARS—Wire Mill
Farrel-Birmingham Co., Ansonia, Conn.

GRINDERS—Roll
Farrel-Birmingham Co., Ansonia, Conn.
Norton Co., Worcester, Mass.

HANDLING EQUIPMENT — Material
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

HOISTS—Electric Traveling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

HOISTS—Monorail
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

INHIBITORS
American Chemical Paint Co., Ambler, Pa.

INSTRUMENTS—Electrical
Leeds & Northrup Co., Philadelphia, Pa.

INSULATION — Cable or Cable Filler
E. W. Twitchell, Inc., Phila., Pa.

LATHES—Die Reaming
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

LIME—Pulverized
Warner Company, Bellefonte, Pa.

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Magnus Chemical Co., Garwood, N. J.

LUBRICANTS—Wire Drawing
Magnus Chemical Co., Garwood, N. J.
R. H. Miller Co., Homer, N. Y.

MACHINERY—Armoring (Cable, Wire Hose)
Amer. Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Hoboken, N. J.
New England Butt Co., Providence, R. I.
John Robertson Co., Brooklyn, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Brazing
Thomson-Judd Wire Machinery Co., Lynn, Mass.

MACHINERY—Bunching
Amer. Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Hoboken, N. J.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Electric
Amer. Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Hoboken, N. J.
New England Butt Co., Providence, R. I.
Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Chain Making
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Coilers
Broden Construction Co., Cleveland, O.
Elevator Supplies Co., Inc., Hoboken, N. J.
Farrel-Birmingham Co., Ansonia, Conn.
Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Copper Wire Drawing and Rolling
Elevator Supplies Co., Inc., Hoboken, N. J.
Farrel-Birmingham Co., Ansonia, Conn.
H. J. Ruesch Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Cutting
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Ansonia, Conn.
Hallden Machine Co., Thomaston, Conn.
Lewis Machine Co., The, Cleveland, O.
F. B. Shuster Co., New Haven, Conn.
W. A. Schuyler, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Enameling
Amer. Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Hoboken, N. J.

MACHINERY—Extruding
John Robertson Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Flat Wire
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Forming
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Galvanizing Wire
Broden Construction Co., Cleveland, O.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Gang Winders
H. J. Ruesch Machine Co., Newark, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., Worcester, Mass.

MACHINERY—Insulating
Amer. Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Hoboken, N. J.
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lead Encasing Presses, etc.
John Robertson Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
John Robertson Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Magnet Wire
Amer. Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Hoboken, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Material Handling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MACHINERY — Measuring Wire & Cable
Durant Mfg. Co., Milwaukee, Wis., and Providence, R. I.
Lyon-Vail Machine Co., Inc., Brockton, Mass.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works Co., Chicago, Ill.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Panning
Amer. Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Hoboken, N. J.

MACHINERY—Pointing
Broden Construction Co., Cleveland, O.
Elevator Supplies Co., Inc., Hoboken, N. J.
H. J. Ruesch Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Rod Mill
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Ansonia, Conn.
Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
W. A. Schuyler, New York, N. Y.

MACHINERY—Rolling Mill
Broden Construction Co., Cleveland, O.
Elevator Supplies Co., Inc., Hoboken, N. J.
Farrel-Birmingham Co., Ansonia, Conn.
Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Rubber Strip Covering
Farrel-Birmingham Co., Ansonia, Conn.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Rubber Tubing and Straining
Farrel-Birmingham Co., Ansonia, Conn.
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Screw Wire
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
Amer. Insulating Mach'y Co., Phila., Pa.
Broden Construction Co., Cleveland, O.
Elevator Supplies Co., Inc., Hoboken, N. J.
H. J. Ruesch Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY— Special — Combination Machine for Drawing, Cutting-to-length. Straightening and Reeling Bars from Coil in One Operation (Schumag Type)—
W. A. Schuyler, New York, N. Y.

BUYERS' GUIDE, Continued

MACHINERY—Spooling
Amer. Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Hoboken, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spring Making
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Broden Construction Co., Cleveland, O.
Hallden Machine Co., Thomaston, Conn.
Lewis Machine Co., The, Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
W. A. Schuyler, New York, N. Y.
F. B. Shuster, New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Stranding
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.

MACHINERY—Swaging
Elevator Supplies Co., Inc., Hoboken, N. J.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Taping
Amer. Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Hoboken, N. J.
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Testing Wire
Henry L. Scott Co., Providence, R. I.

MACHINERY—Tinsel Rolling Mills
Amer. Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Hoboken, N. J.

MACHINERY—Trolley Wire
Vaughn Machinery Co., Cuyahoga Fall, O.

MACHINERY—Tube Mill
H. J. Ruesch Machine Co., Newark, N. J.

MACHINERY—Welding Wire
Micro Products Co., Chicago, Ill.
F. B. Shuster Co., New Haven, Conn.
Thomson-Judd Wire Machinery Co., Lynn, Mass.

MACHINERY—Winding
Amer. Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc., Hoboken, N. J.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Drawing
Amer. Insulating Mach'y Co., Phila., Pa.
Broden Construction Co., Cleveland, O.
Elevator Supplies Co., Inc. Hoboken, N. J.
Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
W. A. Schuyler, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Tinning
Amer. Insulating Mach'y Co., Phila., Pa.
Elevator Supplies Co., Inc. Hoboken, N. J.

MACHINERY—Wrapping Wire
W. A. Schuyler, New York, N. Y.

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MILLS—Tandem Rolling and Edging
Torrington Mfg. Co., Torrington, Conn.

MONORAIL SYSTEMS—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Hudson Wire Co., Ossining, N. Y.
Seymour Mfg. Co., Seymour, Conn.

OVENS—Annealing or Drying
Lindberg Engineering Co., Chicago, Ill.

PAPER—Insulating
E. W. Twitchell, Inc., Phila., Pa.

PATENT ATTORNEYS—
Lancaster, Allwin and Rommel, Washington, D. C.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.

POTS — Annealing, Case Hardening and Tempering
Lindberg Engineering Co., Chicago, Ill.

POTS—Lead Melting
Farrel-Birmingham Co., Ansonia, Conn.
John Robertson Co., Brooklyn, N. Y.

PRESSES—Hydraulic and Mechanical
Farrel-Birmingham Co., Ansonia, Conn.
John Robertson Co., Brooklyn, N. Y.

PRESSES—Lead
John Robertson Co., Brooklyn, N. Y.

PULLERS—Wire
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
John Robertson Co., Brooklyn, N. Y.

PYROMETERS—
Leeds & Northrup Co., Philadelphia, Pa.

RECORDERS—
Leeds & Northrup Co., Philadelphia, Pa.

REEL AND TENSION STAND—
Sleeper & Hartley, Inc., Worcester, Mass.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REFRACTORIES—High Temperature
Norton Co., Worcester, Mass.

ROD BAKERS—
Morrison Engineering Co., Cleveland, O.

RODS—Wire—Non Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.

RODS—Wire—Steel
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

ROLLS—
Farrel-Birmingham Co., Ansonia, Conn.

RUST PROOF COMPOUND—
American Lanolin Co., Lawrence, Mass.

SHEET—Steel
Continental Steel Corp., Kokomo, Ind.
Republic Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

SKIN PROTECTOR—
Magnus Chemical Co., Garwood, N. J.

SOAPS—Industrial and Wire Drawing
Magnus Chemical Co., Garwood, N. J.
R. H. Miller Co., Homer, N. Y.

STRIP—Brass, Zinc and Non Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

STRIP—Steel
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Co., Youngstown, O.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TESTERS—Wire
Henry L. Scott Co., Providence, R. I.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

TREADS—Safety
Norton Co., Worcester, Mass.

TRUCKS
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Fall, O.

TUBE BENDERS AND FORMERS—
H. J. Ruesch Machine Co., Newark, N. J.

VALVES AND FITTINGS—Acid Proof
Duriron C., The, Dayton, O.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
Amer. Insulating Mach'y Co., Phila., Pa.

WIRE—Cold Heading
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE—Electric
Hudson Wire Co., Ossining, N. Y.
Seymour Mfg. Co., Seymour, Conn.

WIRE—Enameled For Coils
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE—Nickel Silver and Phosphor Bronze
Hudson Wire Co., Ossining, N. Y.
Seymour Mfg. Co., Seymour, Conn.

WIRE—Non Ferrous to Specification For Special Purposes
Hudson Wire Co., Ossining, N. Y.
Seymour Mfg. Co., Seymour, Conn.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Co., Youngstown, O.
Seymour Mfg. Co., Seymour, Conn.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE AND STRIP—Brass, Zinc
Platt Bros. & Co., The, Waterbury, Conn.

This is a carefully classified index of concerns who specialize in this industry and who advertise regularly in WIRE & WIRE PRODUCTS. Please mention WIRE when writing to these firms.

THE WATSON MACHINE COMPANY

ESTABLISHED 1845

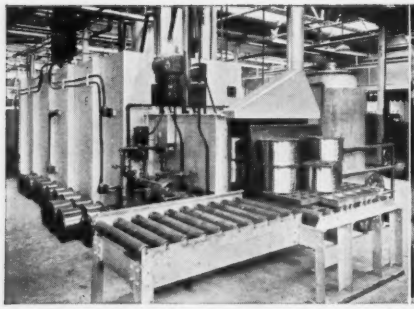
PATERSON, NEW JERSEY, U. S. A.

Electric Cable and Wire Rope Machinery:

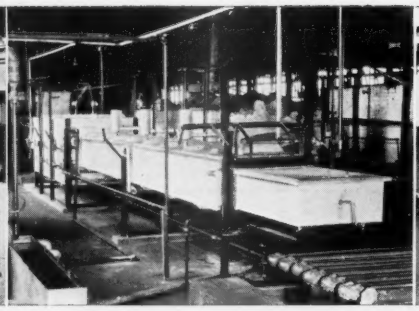
STRANDERS	Planetary & Rigid Frame types (*horizontal and vertical.*) High-Speed Tubular and Built-up types.
BUNCHERS	High-speed types for spools up to 1500 lb. capacity.
ARMORING MACHINES	For Wire (*planetary type*) and for Tape.
PAIRING & TRIPLING MACHINES	For Bare & Insulated Wire.
CLOSERS	For Wire in Planetary, High-speed & Angular types.
CLOSERS & CABLERS	For electric cable in Planetary and Angular types.
TAPING MACHINES	Eccentric and Concentric types, for Paper, Friction and Varnished Cambric and Burlap types.
TAPING HEADS	For applying steel tape in Eccentric and Concentric high-speed types.
JUTE & BURLAP	Applying Heads.
THREAD SERVERS	For Cotton, Asbestos, etc. application on hose and wire.
COMPOUND TANKS	Electrical or Steam heated for machine or unit application.
CHALK APPLIERS	Wet and Dry types.
CAPSTAN SECTIONS	With Single tapered and double grooved wheels, with Lay Control by gears or variable speed transmission.
LET OFF REEL STANDS	Shaft and Shaftless types, for any size of reels.
WINDERS	For steel and copper, in single or multiple head units.
COILING MACHINES	Power or manual drive for package coiling—also for warehouse and shipping room use.
COILING HEADS	For wire rope and insulated wire and cable.
TAKEUP STANDS	Inclined frame, Shaftless and Heavy-duty types.
TRAVERSES	Light and Heavy, manual, mechanical and motorized.
TEMPERING & GALVANIZING MULTIPLE HEAD TAKEUPS	For wire.
MEASURING MACHINES	For Length Measurement.
ELECTRIC PATCH VULCANIZERS	
SATURATING, WAXING & GREASING TANKS	Gas fired and Electrical.
WIRE TINNING MACHINES	Gas fired and Electrical.
CABLE PEELERS	For removing lead sheathing and insulation.
POLISHING HEADS	Separately or Motor driven.
REEL CRUTCHES	For turning heavy reels in handling and shipment.
MOTORIZED WINCHES	For general duty in cable and rope plants.
CUTTERS	For wire rope, cable and chain.
SPOOLS	Heavy-duty for Rope-Mills and Cable-plants.

Send for descriptive catalogue.

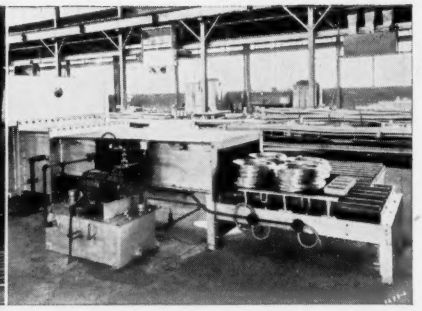
ELECTRICAL WIRE AND CABLE—WIRE ROPE AND CORDAGE MACHINERY



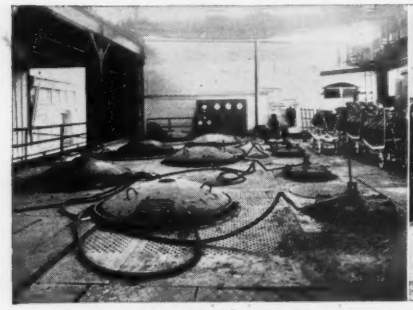
BRIGHT ANNEALING COPPER WIRE
— on large reels — 36,000 lbs. per day



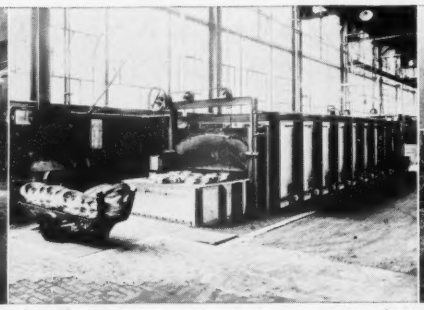
BRIGHT ANNEALING FINE WIRE
— on small spools — 5 tons per day



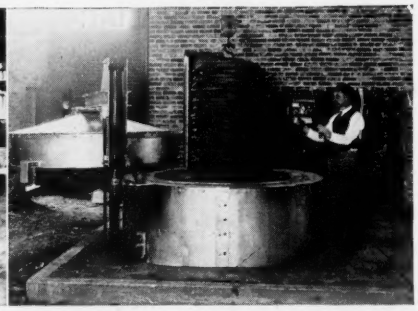
BRIGHT ANNEALING COILED WIRE
— bronze, copper, nickel-silver, etc.



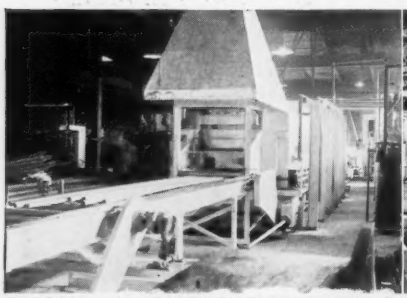
NORMALIZING AND SPHEROIDIZING ROD
— also used for bright annealing wire



CLEAN ANNEALING BRASS WIRE
— continuous conveyor gas-fired furnace

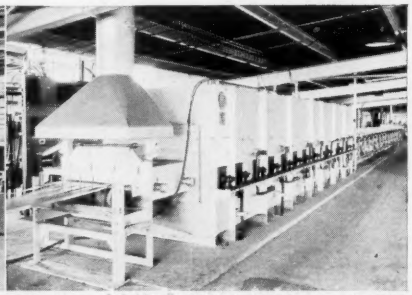


ANNEALING SPECIAL ALLOY WIRE
— in controlled atmosphere pit furnaces

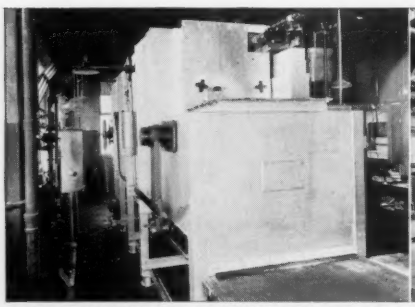


BRIGHT ANNEALING STEEL TUBING
— various lengths and diameters — continuously

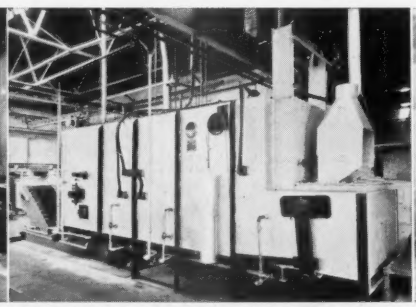
BRIGHT ANNEALING STAMPINGS ETC.
— ferrous and non-ferrous — continuously



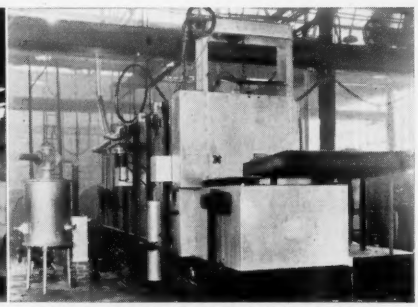
BRIGHT ANNEALING STEEL IN STRIP
— more uniform anneal and finish



SCALE FREE HARDENING BOLTS
— 400 lbs. per hour



CLEAN HARDENING SMALL PARTS
— 800 lbs. per hour



SCALE FREE HARDENING BOLTS
— 1000 lbs. per hour

Some Electric and Fuel-Fired Furnaces Designed and Built by

The Electric Furnace Co., Salem, Ohio

We Build Gas-Fired, Oil-Fired, and Electric Furnaces—Designed to Fit Any Specific Requirement